

A NON-COMPACTNESS RESULT ON THE FRACTIONAL YAMABE PROBLEM IN LARGE DIMENSIONS (SUPPLEMENT)

SEUNGHYEOK KIM, MONICA MUSSO, AND JUNCHENG WEI

ABSTRACT. This article provides all detailed data needed in the paper ‘A non-compactness result on the fractional Yamabe problem in large dimensions [1]’. Part of the computations is obtained with Mathematica.

1. THE VALUES OF INTEGRALS $F_{1,n,\gamma}$, $F_{2,n,\gamma}$ AND $F_{3,n,\gamma}$

The notations in the main article [1] are preserved here. Fix any $n \in \mathbb{N}$ and $\gamma \in (0, 1)$. We recall the standard bubble W_1 (refer to (2.17) of [1]) and functions

$$\begin{aligned} F_{1,n,\gamma}(\alpha, \beta) &= \int_0^\infty \int_{\mathbb{R}^n} x_N^{\alpha-2\gamma} |\bar{x}|^\beta W_1^2(\bar{x}, x_N) d\bar{x} dx_N, \\ F_{2,n,\gamma}(\alpha, \beta) &= \int_0^\infty \int_{\mathbb{R}^n} x_N^{\alpha-2\gamma} |\bar{x}|^\beta |\nabla_{\bar{x}} W_1|^2(\bar{x}, x_N) d\bar{x} dx_N, \\ F_{3,n,\gamma}(\alpha, \beta) &= \int_0^\infty \int_{\mathbb{R}^n} x_N^{\alpha-2\gamma} |\bar{x}|^\beta |\partial_{x_N} W_1|^2(\bar{x}, x_N) d\bar{x} dx_N, \\ F_{4,n,\gamma}(\alpha, \beta) &= \int_0^\infty \int_{\mathbb{R}^n} x_N^{\alpha-2\gamma} |\bar{x}|^\beta |\nabla W_1|^2(\bar{x}, x_N) d\bar{x} dx_N = F_{2,n,\gamma}(\alpha, \beta) + F_{3,n,\gamma}(\alpha, \beta) \end{aligned}$$

where $(\alpha, \beta) \in (2\mathbb{N} + 1) \times (2\mathbb{N})$, and the numbers

$$A_1 = \int_0^\infty t^{1-2\gamma} \varphi^2(t) dt \quad \text{and} \quad B_2 = \int_0^\infty \rho^{-2+2\gamma} \hat{w}_1^2(\rho) \rho^{n-1} d\rho.$$

In this section, we explicitly describe certain values of $F_{1,n,\gamma}$, $F_{2,n,\gamma}$ and $F_{3,n,\gamma}$ required in the derivation of the polynomial P for the case $d_0 = \deg f = 4$ (see (2.2) for the definition of f), complementing Lemmas 4.4 and B.1 in [1]. The notation $c_1 \cong c_2$ will be used to signify $c_1 = c_2 \cdot |S^{n-1}| A_1 B_2$ for any given $c_1, c_2 \in \mathbb{R}$.

Lemma 1.1. *It holds that*

$$F_{1,n,\gamma}(1, 0) \cong 1,$$

$$\begin{aligned} F_{1,n,\gamma}(1, 8) &\cong (n(48 + 44n + 12n^2 + n^3)(-15120n^7 + 315n^8 - 840n^6(-371 + 2\gamma^2) + 30240n^5(-119 + 2\gamma^2) + 336n^4(75707 - 2690\gamma^2 + 18\gamma^4) \\ &\quad - 8064n^3(13967 - 890\gamma^2 + 18\gamma^4) - 384n^2(-794068 + 83335\gamma^2 - 3507\gamma^4 + 30\gamma^6) + 4608n(-100186 + 16555\gamma^2 - 1239\gamma^4 + 30\gamma^6) \\ &\quad + 1280(234288 - 59920\gamma^2 + 7455\gamma^4 - 390\gamma^6 + 7\gamma^8)) / (315(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\ &\quad (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))), \end{aligned}$$

$$\begin{aligned} F_{1,n,\gamma}(1, 10) &\cong (n(384 + 400n + 140n^2 + 20n^3 + n^4)(-48510n^9 + 693n^{10} - 4620n^8(-325 + \gamma^2) + 129360n^7(-209 + 2\gamma^2) + 3696n^6(84773 \\ &\quad - 1700\gamma^2 + 6\gamma^4) - 51744n^5(47147 - 1670\gamma^2 + 18\gamma^4) - 10560n^4(-1222801 + 69727\gamma^2 - 1554\gamma^4 + 6\gamma^6) + 295680n^3(-155042 \\ &\quad + 13475\gamma^2 - 525\gamma^4 + 6\gamma^6) + 2816n^2(37079964 - 4756850\gamma^2 + 296079\gamma^4 - 6900\gamma^6 + 35\gamma^8) - 39424n(3495168 - 651140\gamma^2 \\ &\quad + 61467\gamma^4 - 2490\gamma^6 + 35\gamma^8) - 3072(-26074080 + 7033796\gamma^2 - 980595\gamma^4 + 64383\gamma^6 - 1925\gamma^8 + 21\gamma^{10})) / (693(-12 + n)(-10 + n) \\ &\quad (-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma)) \\ &\quad (n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \end{aligned}$$

$$\begin{aligned} F_{1,n,\gamma}(1, 12) &\cong (n(3840 + 4384n + 1800n^2 + 340n^3 + 30n^4 + n^5)(-288288n^{11} + 3003n^{12} - 12012n^{10}(-1039 + 2\gamma^2) + 960960n^9(-335 + 2\gamma^2) \\ &\quad + 144144n^8(38195 - 475\gamma^2 + \gamma^4) - 9225216n^7(7123 - 155\gamma^2 + \gamma^4) - 27456n^6(-20422835 + 705992\gamma^2 - 9394\gamma^4 + 20\gamma^6) \\ &\quad + 1317888n^5(-2613043 + 135240\gamma^2 - 3122\gamma^4 + 20\gamma^6) + 36608n^4(412298034 - 30763565\gamma^2 + 1119762\gamma^4 - 14610\gamma^6 + 35\gamma^8) \\ &\quad - 1171456n^3(39271314 - 4125485\gamma^2 + 223314\gamma^4 - 5010\gamma^6 + 35\gamma^8) - 13312n^2(-6949145736 + 1014173468\gamma^2 - 78660813\gamma^4 \\ &\quad + 2767248\gamma^6 - 38885\gamma^8 + 126\gamma^{10}) + 212992n(-517231368 + 104371036\gamma^2 - 11334477\gamma^4 + 591888\gamma^6 - 14245\gamma^8 + 126\gamma^{10}) \\ &\quad + 86016(683628480 - 191383192\gamma^2 + 28754726\gamma^4 - 2163161\gamma^6 + 83083\gamma^8 - 1547\gamma^{10} + 11\gamma^{12})) / (3003(-14 + n)(-12 + n) \\ &\quad (-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma) \\ &\quad (n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \end{aligned}$$

$$\begin{aligned} F_{1,n,\gamma}(1, 14) &\cong (n(46080 + 56448n + 25984n^2 + 5880n^3 + 700n^4 + 42n^5 + n^6)(-810810n^{13} + 6435n^{14} - 60060n^{12}(-778 + \gamma^2) \\ &\quad + 3243240n^{11}(-503 + 2\gamma^2) + 48048n^{10}(801676 - 6610\gamma^2 + 9\gamma^4) - 4324320n^9(150355 - 2155\gamma^2 + 9\gamma^4) - 411840n^8(-19629718 \\ &\quad + 443002\gamma^2 - 3808\gamma^4 + 5\gamma^6) + 7413120n^7(-10138267 + 338632\gamma^2 - 5026\gamma^4 + 20\gamma^6) - 69189120n^5(39482934 - 2589635\gamma^2 \\ &\quad + 88494\gamma^4 - 1230\gamma^6 + 5\gamma^8) + 256256n^6(2046730449 - 97124590\gamma^2 + 2255736\gamma^4 - 18300\gamma^6 + 25\gamma^8) - 465920n^4(-22416484920 \\ &\quad + 1995755905\gamma^2 - 96336174\gamma^4 + 2082036\gamma^6 - 17050\gamma^8 + 27\gamma^{10}) + 8386560n^3(-3386308584 + 404828732\gamma^2 - 26852793\gamma^4 \\ &\quad + 849552\gamma^6 - 11825\gamma^8 + 54\gamma^{10}) - 4055040n(14053737024 - 3003166712\gamma^2 + 358535814\gamma^4 - 21885981\gamma^6 + 690599\gamma^8 \\ &\quad - 10647\gamma^{10} + 63\gamma^{12}) + 4096n^2(12666982100688 - 2023748526800\gamma^2 + 181110957027\gamma^4 - 8063007810\gamma^6 + 173793620\gamma^8 \end{aligned}$$

$$\begin{aligned}
& -1580670\gamma^{10} + 3465\gamma^{12}) - 49152(-577880352000 + 166253376432\gamma^2 - 26340674360\gamma^4 + 2171047879\gamma^6 - 97191380\gamma^8 \\
& + 2366546\gamma^{10} - 29260\gamma^{12} + 143\gamma^{14}))/((6435(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma) \\
& (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{1,n,\gamma}(1, 16) & \cong (n(645120 + 836352n + 420224n^2 + 108304n^3 + 15680n^4 + 1288n^5 + 56n^6 + n^7)(-17503200n^{15} + 109395n^{16} - 583440n^{14}(-2219 \\
& + 2\gamma^2) + 81681600n^{13}(-719 + 2\gamma^2) + 1633632n^{12}(1118719 - 6430\gamma^2 + 6\gamma^4) - 65345280n^{11}(632657 - 6290\gamma^2 + 18\gamma^4) \\
& - 5601024n^{10}(-125459597 + 1951495\gamma^2 - 11473\gamma^4 + 10\gamma^6) + 560102400n^9(-16333547 + 372995\gamma^2 - 3773\gamma^4 + 10\gamma^6) \\
& + 622336n^8(148025150709 - 4754472980\gamma^2 + 74864706\gamma^4 - 404700\gamma^6 + 350\gamma^8) - 49786880n^7(14447051709 - 633507980\gamma^2 \\
& + 14573706\gamma^4 - 134700\gamma^6 + 350\gamma^8) - 6336512n^6(-684354176772 + 40125519115\gamma^2 - 1292069658\gamma^4 + 18486930\gamma^6 - 97075\gamma^8 \\
& + 90\gamma^{10}) + 126730240n^5(-157477680366 + 12172318345\gamma^2 - 532480674\gamma^4 + 11075790\gamma^6 - 98725\gamma^8 + 270\gamma^{10}) \\
& + 139264n^4(493115711625432 - 49803558404600\gamma^2 + 2898007645533\gamma^4 - 84000010380\gamma^6 + 1152666515\gamma^8 - 6298110\gamma^{10} \\
& + 6930\gamma^{12}) - 5570560n^3(30636320589432 - 4025393472100\gamma^2 + 307040266533\gamma^4 - 12041695380\gamma^6 + 239254015\gamma^8 \\
& - 2203110\gamma^{10} + 6930\gamma^{12}) - 36765696n^2(-7851401381088 + 1341787333224\gamma^2 - 132873738452\gamma^4 + 6906768973\gamma^6 \\
& - 190779095\gamma^8 + 2696057\gamma^{10} - 16765\gamma^{12} + 26\gamma^{14}) + 66846720n(-4439785704768 + 990716905464\gamma^2 - 126681977422\gamma^4 \\
& + 8605585703\gamma^6 - 321544795\gamma^8 + 6588127\gamma^{10} - 68915\gamma^{12} + 286\gamma^{14}) + 589824(236937560832000 - 69606818176896\gamma^2 \\
& + 11474198061040\gamma^4 - 100998701712\gamma^6 + 50192577435\gamma^8 - 1444020188\gamma^{10} + 23679810\gamma^{12} - 204204\gamma^{14} + 715\gamma^{16}))) \\
& /((109395(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(1, 18) & \cong (n(10321920 + 14026752n + 7559936n^2 + 2153088n^3 + 359184n^4 + 36288n^5 + 2184n^6 + 72n^7 + n^8)(-45727110n^{17} \\
& + 230945n^{18} - 2771340n^{16}(-1523 + \gamma^2) + 243877920n^{15}(-989 + 2\gamma^2) + 4434144n^{14}(2155359 - 8980\gamma^2 + 6\gamma^4) \\
& - 682858176n^{13}(408119 - 2930\gamma^2 + 6\gamma^4) - 5912192n^{12}(-1047677173 + 11710545\gamma^2 - 49182\gamma^4 + 30\gamma^6) \\
& + 780409344n^{11}(-137391511 + 2241085\gamma^2 - 16149\gamma^4 + 30\gamma^6) + 11824384n^{10}(123847974537 - 2820692740\gamma^2 + 31515498\gamma^4 \\
& - 119400\gamma^6 + 70\gamma^8) - 260136448n^9(61073128869 - 1882328180\gamma^2 + 30568146\gamma^4 - 197700\gamma^6 + 350\gamma^8) \\
& - 12899328n^8(-10630757535201 + 433498926135\gamma^2 - 9790273614\gamma^4 + 97723890\gamma^6 - 350350\gamma^8 + 210\gamma^{10}) \\
& + 1135140864n^7(-826945465798 + 43896325935\gamma^2 - 1336118322\gamma^4 + 19301370\gamma^6 - 117425\gamma^8 + 210\gamma^{10}) \\
& + 2646016n^6(1910047898017796 - 130493808695250\gamma^2 + 5232814385799\gamma^4 - 104700821940\gamma^6 + 978122145\gamma^8 \\
& - 3510780\gamma^{10} + 2310\gamma^{12}) - 174637056n^5(120787305938264 - 10542892059700\gamma^2 + 547824067791\gamma^4 - 14715532260\gamma^6 \\
& + 198102905\gamma^8 - 1198470\gamma^{10} + 2310\gamma^{12}) - 10584064n^4(-6300916031193624 + 699900725066972\gamma^2 - 46569616214121\gamma^4 \\
& + 1641782502789\gamma^6 - 30502843085\gamma^8 + 281964501\gamma^{10} - 1078770\gamma^{12} + 858\gamma^{14}) + 465698816n^3(-330643131748704 \\
& + 46706189579192\gamma^2 - 3947359782366\gamma^4 + 179645088909\gamma^6 - 4467884135\gamma^8 + 59322081\gamma^{10} - 379995\gamma^{12} + 858\gamma^{14}) \\
& + 3735552n^2(65406534603102720 - 11777811380965344\gamma^2 + 1258102052401480\gamma^4 - 73039687274268\gamma^6 + 2379091476905\gamma^8 \\
& - 43535119732\gamma^{10} + 425097750\gamma^{12} - 1886456\gamma^{14} + 2145\gamma^{16}) - 82182144n(2891677956940800 - 667540296728448\gamma^2 \\
& + 89931843979120\gamma^4 - 6606386356856\gamma^6 + 277500242305\gamma^8 - 6804537844\gamma^{10} + 95648630\gamma^{12} - 709852\gamma^{14} + 2145\gamma^{16}) \\
& - 1310720(-81352764489830400 + 24298440238245888\gamma^2 - 4130483919653520\gamma^4 + 382099801334680\gamma^6 \\
& - 20490480807225\gamma^8 + 661456263507\gamma^{10} - 12958963490\gamma^{12} + 149929494\gamma^{14} - 937365\gamma^{16} + 2431\gamma^{18}))/((230945(-20+n) \\
& (-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(3, 0) & \cong -((8(-3+n)(-1+\gamma^2))/(3(-4+n)(-4+n+2\gamma)(n-2(2+\gamma))), \\
F_{1,n,\gamma}(3, 6) & \cong -((8n(-24-10n+3n^2+n^3)(-1+\gamma^2)(-3780n^5+105n^6-84n^4(-662+3\gamma^2)+2016n^3(-212+3\gamma^2)+48n^2(37655-1146\gamma^2 \\
& +9\gamma^4)-576n(6911-390\gamma^2+9\gamma^4)-320(-11124+1099\gamma^2-56\gamma^4+\gamma^6)))/(315(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))), \\
F_{1,n,\gamma}(3, 8) & \cong -((8n(-144-84n+8n^2+9n^3+n^4)(-1+\gamma^2)(-64680n^7+1155n^8-1848n^6(-843+2\gamma^2)+51744n^5(-407+3\gamma^2) \\
& -29568n^3(30704-852\gamma^2+9\gamma^4)+528n^4(330663-5134\gamma^2+18\gamma^4)+39424n(-130104+9320\gamma^2-361\gamma^4+5\gamma^6) \\
& -1408n^2(-2050962+93463\gamma^2-2045\gamma^4+10\gamma^6)+1280(3037536-336868\gamma^2+21567\gamma^4-642\gamma^6+7\gamma^8)))/(3465(-12+n) \\
& (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
& (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))), \\
F_{1,n,\gamma}(3, 10) & \cong -((8n(-1152-816n-20n^2+80n^3+17n^4+n^5)(-1+\gamma^2)(-240240n^9+3003n^{10}-12012n^8(-709+\gamma^2)+768768n^7(-229 \\
& +\gamma^2)+6864n^6(342089-3116\gamma^2+6\gamma^4)-109824n^5(192091-3076\gamma^2+18\gamma^4)-9152n^4(-14113659+362113\gamma^2-4358\gamma^4 \\
& +10\gamma^6)+292864n^3(-1815195+70657\gamma^2-1478\gamma^4+10\gamma^6)+3328n^2(422374020-24164886\gamma^2+802595\gamma^4-11020\gamma^6 \\
& +35\gamma^8)-53248n(40437828-3348310\gamma^2+167587\gamma^4-3980\gamma^6+35\gamma^8)-7168(-202105440+24189044\gamma^2-1775895\gamma^4
\end{aligned}$$

$$\begin{aligned}
& + 67947\gamma^6 - 1265\gamma^8 + 9\gamma^{10})) / (9009(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))), \\
F_{1,n,\gamma}(3, 12) & \cong -(8n(-11520 - 9312n - 1016n^2 + 780n^3 + 250n^4 + 27n^5 + n^6)(-1 + \gamma^2)(-1621620n^{11} + 15015n^{12} + 2162160n^9(-1067 \\
& + 3\gamma^2) - 12012n^{10}(-6589 + 6\gamma^2) + 102960n^8(434143 - 2531\gamma^2 + 3\gamma^4) - 3706560n^7(163505 - 1660\gamma^2 + 6\gamma^4) \\
& + 4942080n^5(-8363487 + 199945\gamma^2 - 2558\gamma^4 + 10\gamma^6) - 9152n^6(-643701027 + 10330948\gamma^2 - 76610\gamma^4 + 100\gamma^6) \\
& - 4193280n^3(173253876 - 8319670\gamma^2 + 246503\gamma^4 - 3340\gamma^6 + 15\gamma^8) + 16640n^4(12472148112 - 427629361\gamma^2 + 8574638\gamma^4 \\
& - 67930\gamma^6 + 105\gamma^8) + 184320n(-12506675616 + 1142634500\gamma^2 - 66976903\gamma^4 + 2087807\gamma^6 - 32025\gamma^8 + 189\gamma^{10}) \\
& - 1024n^2(-1641602730672 + 108961034408\gamma^2 - 4594410595\gamma^4 + 97062620\gamma^6 - 873075\gamma^8 + 1890\gamma^{10}) \\
& + 86016(16447852800 - 2078128624\gamma^2 + 167274536\gamma^4 - 7463027\gamma^6 + 181753\gamma^8 - 2249\gamma^{10} + 11\gamma^{12})) \\
& / (45045(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\
& (n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{1,n,\gamma}(3, 14) & \cong -(8n(-138240 - 123264n - 21504n^2 + 8344n^3 + 3780n^4 + 574n^5 + 39n^6 + n^7)(-1 + \gamma^2)(-5105100n^{13} + 36465n^{14} \\
& - 204204n^{12}(-1604 + \gamma^2) + 8168160n^{11}(-1562 + 3\gamma^2) - 35006400n^9(182122 - 1250\gamma^2 + 3\gamma^4) + 116688n^{10}(2887166 - 11450\gamma^2 \\
& + 9\gamma^4) - 155584n^8(-572739492 + 6161308\gamma^2 - 30290\gamma^4 + 25\gamma^6) + 12446720n^7(-75025992 + 1188808\gamma^2 - 10040\gamma^4 + 25\gamma^6) \\
& + 56576n^6(130224170229 - 2916778470\gamma^2 + 38338156\gamma^4 - 193700\gamma^6 + 175\gamma^8) - 1131520n^5(38454613887 - 1184192210\gamma^2 \\
& + 22768468\gamma^4 - 196100\gamma^6 + 525\gamma^8) - 17408n^4(-10867610220432 + 451777098873\gamma^2 - 12193210930\gamma^4 + 162422360\gamma^6 \\
& - 872200\gamma^8 + 945\gamma^{10}) + 696320n^3(-842401816182 + 46758231373\gamma^2 - 1722503930\gamma^4 + 33397360\gamma^6 - 303450\gamma^8 + 945\gamma^{10}) \\
& - 4177920(368403710688 - 36155995708\gamma^2 + 2361980789\gamma^4 - 87263294\gamma^6 + 1779946\gamma^8 - 18578\gamma^{10} + 77\gamma^{12}) \\
& + 69632n^2(17587895865264 - 1297322574424\gamma^2 + 64016195367\gamma^4 - 1736025882\gamma^6 + 24309838\gamma^8 - 150234\gamma^{10} + 231\gamma^{12}) \\
& - 49152(-17848125792000 + 2348288431632\gamma^2 - 201978937160\gamma^4 + 10007226229\gamma^6 - 288032030\gamma^8 + 4727996\gamma^{10} - 40810\gamma^{12} \\
& + 143\gamma^{14})) / (109395(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(3, 16) & \cong -(8n(-1935360 - 1863936n - 424320n^2 + 95312n^3 + 61264n^4 + 11816n^5 + 1120n^6 + 53n^7 + n^8)(-1 + \gamma^2)(-121938960n^{15} \\
& + 692835n^{16} + 682858176n^{13}(-729 + \gamma^2) - 2217072n^{14}(-4483 + 2\gamma^2) + 4434144n^{12}(3865315 - 10914\gamma^2 + 6\gamma^4) \\
& - 390204672n^{11}(1101781 - 5360\gamma^2 + 9\gamma^4) - 11824384n^{10}(-686946147 + 5206873\gamma^2 - 17885\gamma^4 + 10\gamma^6) \\
& + 520272896n^9(-226504947 + 2509603\gamma^2 - 14765\gamma^4 + 25\gamma^6) - 189190144n^7(61318475514 - 1292326630\gamma^2 + 17120586\gamma^4 \\
& - 100200\gamma^6 + 175\gamma^8) + 1074944n^8(1233496454925 - 19134616052\gamma^2 + 174403458\gamma^4 - 599700\gamma^6 + 350\gamma^8) \\
& - 1323008n^6(-59411914286082 + 1665664029763\gamma^2 - 30717029610\gamma^4 + 276959130\gamma^6 - 973525\gamma^8 + 630\gamma^{10}) \\
& + 58212352n^5(-7004865451692 + 257491643938\gamma^2 - 6412514580\gamma^4 + 83622210\gamma^6 - 496825\gamma^8 + 945\gamma^{10}) \\
& - 232849408n^3(19195198836624 - 1185491353304\gamma^2 + 50792901902\gamma^4 - 1234714882\gamma^6 + 16201213\gamma^8 - 102984\gamma^{10} \\
& + 231\gamma^{12}) + 2646016n^4(599530788943080 - 28631425833724\gamma^2 + 942361644511\gamma^4 - 17030521364\gamma^6 + 155069201\gamma^8 \\
& - 587118\gamma^{10} + 462\gamma^{12}) + 164364288n(-61172309347200 + 6340637748112\gamma^2 - 448480937380\gamma^4 + 18640462794\gamma^6 \\
& - 455258565\gamma^8 + 6387451\gamma^{10} - 47355\gamma^{12} + 143\gamma^{14}) - 1245184n^2(-6899881852990080 + 550925504872120\gamma^2 \\
& - 30417920023542\gamma^4 + 973882657983\gamma^6 - 17676403081\gamma^8 + 171760239\gamma^{10} - 759297\gamma^{12} + 858\gamma^{14}) \\
& + 983040(5482321773465600 - 744371989650432\gamma^2 + 67316616834896\gamma^4 - 3600161308744\gamma^6 + 116294729837\gamma^8 \\
& - 2281028516\gamma^{10} + 26418238\gamma^{12} - 165308\gamma^{14} + 429\gamma^{16})) / (2078505(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n) \\
& (-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma) \\
& (-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma)) \\
& (n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(5, 4) & \cong (128n(30 - n - 6n^2 + n^3)(4 - 5\gamma^2 + \gamma^4)(-504n^3 + 21n^4 + n^2(4332 - 24\gamma^2) + 144n(-109 + 2\gamma^2) + 16(1254 - 55\gamma^2 + \gamma^4))) \\
& / (315(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))), \\
F_{1,n,\gamma}(5, 6) & \cong (128n(120 + 26n - 25n^2 - 2n^3 + n^4)(4 - 5\gamma^2 + \gamma^4)(-9702n^5 + 231n^6 + 5544n^3(-263 + 2\gamma^2) - 132n^4(-1252 + 3\gamma^2) \\
& + 528n^2(13267 - 220\gamma^2 + \gamma^4) - 7392n(2340 - 73\gamma^2 + \gamma^4) - 64(-266292 + 14735\gamma^2 - 448\gamma^4 + 5\gamma^6)) / (3465(-12+n)(-10+n) \\
& (-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))), \\
F_{1,n,\gamma}(5, 8) & \cong (128n(720 + 276n - 124n^2 - 37n^3 + 4n^4 + n^5)(4 - 5\gamma^2 + \gamma^4)(-192192n^7 + 3003n^8 - 3432n^6(-1537 + 2\gamma^2) + 54912n^5(-1475 \\
& + 6\gamma^2) + 6864n^4(110687 - 954\gamma^2 + 2\gamma^4) - 219648n^3(20255 - 314\gamma^2 + 2\gamma^4) - 1664n^2(-9518484 + 244135\gamma^2 - 3239\gamma^4 + 10\gamma^6) \\
& + 26624n(-1172916 + 47719\gamma^2 - 1127\gamma^4 + 10\gamma^6) + 1792(14495184 - 922640\gamma^2 + 36141\gamma^4 - 690\gamma^6 + 5\gamma^8)) / (45045(-14+n) \\
& (-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)
\end{aligned}$$

$$\begin{aligned}
& (-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma)), \\
F_{1,n,\gamma}(5, 10) & \equiv (128n(5760 + 2928n - 716n^2 - 420n^3 - 5n^4 + 12n^5 + n^6)(4 - 5\gamma^2 + \gamma^4)(-270270n^9 + 3003n^{10} - 8580n^8(-1255 + \gamma^2) \\
& + 308880n^7(-809 + 2\gamma^2) - 617760n^5(60831 - 554\gamma^2 + 2\gamma^4) + 2288n^6(1633203 - 8440\gamma^2 + 10\gamma^4) - 4160n^4(-61776789 \\
& + 904157\gamma^2 - 6726\gamma^4 + 10\gamma^6) + 149760n^3(-7865052 + 175319\gamma^2 - 2271\gamma^4 + 10\gamma^6) - 23040n(253239312 - 12149984\gamma^2 \\
& + 378203\gamma^4 - 5870\gamma^6 + 35\gamma^8) + 256n^2(13493207148 - 444326230\gamma^2 + 9156715\gamma^4 - 82000\gamma^6 + 175\gamma^8) - 7168(-598858560 \\
& + 41893148\gamma^2 - 1917135\gamma^4 + 47949\gamma^6 - 605\gamma^8 + 3\gamma^{10}))/((45045(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n) \\
& (-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{1,n,\gamma}(5, 12) & \equiv (128n(57600 + 35040n - 4232n^2 - 4916n^3 - 470n^4 + 115n^5 + 22n^6 + n^7)(4 - 5\gamma^2 + \gamma^4)(-6126120n^{11} + 51051n^{12} \\
& + 8751600n^9(-1229 + 2\gamma^2) - 29172n^{10}(-11387 + 6\gamma^2) + 116688n^8(1983471 - 6695\gamma^2 + 5\gamma^4) - 9335040n^7(373221 - 2195\gamma^2 \\
& + 5\gamma^4) - 14144n^6(-2657155053 + 24724204\gamma^2 - 115550\gamma^4 + 100\gamma^6) + 848640n^5(-344521653 + 4781204\gamma^2 - 38550\gamma^4 \\
& + 100\gamma^6) - 522240n^3(12043806936 - 337258165\gamma^2 + 6299770\gamma^4 - 56650\gamma^6 + 175\gamma^8) + 4352n^4(373549583058 - 7448737495\gamma^2 \\
& + 94136810\gamma^4 - 494950\gamma^6 + 525\gamma^8) + 1044480n(-23104887696 + 1242217480\gamma^2 - 45977505\gamma^4 + 951036\gamma^6 - 10045\gamma^8 + 42\gamma^{10}) \\
& - 17408n^2(-921305298888 + 35795841940\gamma^2 - 952113515\gamma^4 + 13348108\gamma^6 - 82635\gamma^8 + 126\gamma^{10}) + 86016(187721400960 \\
& - 14059568952\gamma^2 + 715575146\gamma^4 - 21176441\gamma^6 + 354783\gamma^8 - 3107\gamma^{10} + 11\gamma^{12}))/((765765(-18 + n)(-16 + n)(-14 + n)(-12 + n) \\
& (-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\
& (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{1,n,\gamma}(5, 14) & \equiv (128n(691200 + 478080n - 15744n^2 - 63224n^3 - 10556n^4 + 910n^5 + 379n^6 + 34n^7 + n^8)(4 - 5\gamma^2 + \gamma^4)(-21339318n^{13} \\
& + 138567n^{14} - 554268n^{12}(-2718 + \gamma^2) + 12193896n^{11}(-5297 + 6\gamma^2) + 2217072n^{10}(847022 - 1980\gamma^2 + \gamma^4) \\
& - 48775584n^9(802461 - 3245\gamma^2 + 5\gamma^4) - 268736n^8(-2242614702 + 14209984\gamma^2 - 44810\gamma^4 + 25\gamma^6) + 5912192n^7(-1176981303 \\
& + 10984324\gamma^2 - 59450\gamma^4 + 100\gamma^6) + 82688n^6(731470028697 - 9652228700\gamma^2 + 81231692\gamma^4 - 277000\gamma^6 + 175\gamma^8) \\
& - 1819136n^5(216259379988 - 3926111245\gamma^2 + 48293870\gamma^4 - 280450\gamma^6 + 525\gamma^8) - 330752n^4(-5691139684152 \\
& + 139648717787\gamma^2 - 2409659240\gamma^4 + 21619504\gamma^6 - 81130\gamma^8 + 63\gamma^{10}) + 7276544n^3(-881523211248 + 28938390880\gamma^2 \\
& - 681237665\gamma^4 + 8887108\gamma^6 - 56385\gamma^8 + 126\gamma^{10}) - 5136384n(3927684864960 - 229648978384\gamma^2 + 9587561732\gamma^4 \\
& - 237883397\gamma^6 + 3381931\gamma^8 - 25319\gamma^{10} + 77\gamma^{12}) + 77824n^2(188717313653712 - 8257261456568\gamma^2 + 260331021459\gamma^4 \\
& - 4745429844\gamma^6 + 46359278\gamma^8 - 205548\gamma^{10} + 231\gamma^{12}) - 49152(-254377091001600 + 20063345311152\gamma^2 - 1103603621120\gamma^4 \\
& + 36689541889\gamma^6 - 735058610\gamma^8 + 8642816\gamma^{10} - 54670\gamma^{12} + 143\gamma^{14}))/((2078505(-20 + n)(-18 + n)(-16 + n)(-14 + n) \\
& (-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{1,n,\gamma}(7, 2) & \equiv -((1024n(-105 + 71n - 15n^2 + n^3)(244 - 108n + 9n^2 - 4\gamma^2)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6))/(315(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))), \\
F_{1,n,\gamma}(7, 4) & \equiv -((1024n(-210 + 37n + 41n^2 - 13n^3 + n^4)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-2772n^3 + 99n^4 + 1232n(-88 + \gamma^2) - 44n^2(-617 + 2\gamma^2) \\
& + 48(3084 - 85\gamma^2 + \gamma^4)))/(3465(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\
& (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \\
F_{1,n,\gamma}(7, 6) & \equiv -((1024n(-840 - 62n + 201n^2 - 11n^3 - 9n^4 + n^5)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-20592n^5 + 429n^6 - 572n^4(-694 + \gamma^2) \\
& + 18304n^3(-214 + \gamma^2) + 208n^2(99793 - 1036\gamma^2 + 3\gamma^4) - 3328n(16721 - 332\gamma^2 + 3\gamma^4) - 64(-913932 + 32585\gamma^2 - 658\gamma^4 + 5\gamma^6)) \\
& /((15015(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{1,n,\gamma}(7, 8) & \equiv -((1024n(-5040 - 1212n + 1144n^2 + 135n^3 - 65n^4 - 3n^5 + n^6)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-92664n^7 + 1287n^8 + 123552n^5(-394 \\
& + \gamma^2) - 1144n^6(-2489 + 2\gamma^2) - 14976n^3(216967 - 2140\gamma^2 + 9\gamma^4) + 208n^4(2428883 - 13190\gamma^2 + 18\gamma^4) + 4608n(-5810732 \\
& + 153551\gamma^2 - 2442\gamma^4 + 15\gamma^6) - 128n^2(-98416042 + 1622299\gamma^2 - 14361\gamma^4 + 30\gamma^6) + 256(92676672 - 3872428\gamma^2 + 102711\gamma^4 \\
& - 1362\gamma^6 + 7\gamma^8)))/(45045(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{1,n,\gamma}(7, 10) & \equiv -((1024n(-40320 - 14736n + 7940n^2 + 2224n^3 - 385n^4 - 89n^5 + 5n^6 + n^7)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-2187900n^9 + 21879n^{10} \\
& - 48620n^8(-1987 + \gamma^2) + 3889600n^7(-637 + \gamma^2) + 3536n^6(11543377 - 38080\gamma^2 + 30\gamma^4) - 70720n^5(6371131 - 37240\gamma^2 + 90\gamma^4) \\
& - 5440n^4(-619108331 + 5849327\gamma^2 - 29298\gamma^4 + 30\gamma^6) + 217600n^3(-77153281 + 1117327\gamma^2 - 9798\gamma^4 + 30\gamma^6) \\
& + 4352n^2(12230775012 - 263559350\gamma^2 + 3696375\gamma^4 - 23160\gamma^6 + 35\gamma^8) - 87040n(1108639512 - 35095850\gamma^2 + 747375\gamma^4 \\
& - 8160\gamma^6 + 35\gamma^8) - 9216(-8193625920 + 381728732\gamma^2 - 12005455\gamma^4 + 211761\gamma^6 - 1925\gamma^8 + 7\gamma^{10}))/((765765(-18 + n) \\
& (-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma)) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))
\end{aligned}$$

$$\begin{aligned}
& (n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{1,n,\gamma}(7, 12) & \equiv -(1024n(-403200 - 187680n + 64664n^2 + 30180n^3 - 1626n^4 - 1275n^5 - 39n^6 + 15n^7 + n^8)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6) \\
& (-18290844n^{11} + 138567n^{12} + 40646320n^9(-952 + \gamma^2) - 184756n^{10}(-5897 + 2\gamma^2) + 201552n^8(4524133 - 9885\gamma^2 + 5\gamma^4) \\
& - 8868288n^7(1691829 - 6460\gamma^2 + 10\gamma^4) + 13643520n^5(-109509490 + 993487\gamma^2 - 5476\gamma^4 + 10\gamma^6) - 20672n^6(-8539476273 \\
& + 51754648\gamma^2 - 164870\gamma^4 + 100\gamma^6) + 82688n^4(108976913384 - 1426499375\gamma^2 + 12361070\gamma^4 - 45910\gamma^6 + 35\gamma^8) \\
& - 3638272n^3(10355874032 - 191298100\gamma^2 + 2457825\gamma^4 - 15660\gamma^6 + 35\gamma^8) + 856064n(-194348910240 + 6981129248\gamma^2 \\
& - 178996470\gamma^4 + 2637699\gamma^6 - 20300\gamma^8 + 63\gamma^{10}) - 19456n^2(-5312408092752 + 136950239128\gamma^2 - 2514088915\gamma^4 \\
& + 25043168\gamma^6 - 112595\gamma^8 + 126\gamma^{10}) + 12288(9622386489600 - 485489916912\gamma^2 + 17182557392\gamma^4 - 362960741\gamma^6 + 4435431\gamma^8 \\
& - 28847\gamma^{10} + 77\gamma^{12}))/((4849845(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma)) \\
& (n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{1,n,\gamma}(9, 0) & \equiv (32768(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2))/(315(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))), \\
F_{1,n,\gamma}(9, 2) & \equiv (32768n(945 - 744n + 206n^2 - 24n^3 + n^4)(364 - 154n + 11n^2 - 4\gamma^2)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8))/(3465(-12 + n) \\
& (-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \\
F_{1,n,\gamma}(9, 4) & \equiv (32768n(1890 - 543n - 332n^2 + 158n^3 - 22n^4 + n^5)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-4576n^3 + 143n^4 - 52n^2(-963 + 2\gamma^2) \\
& + 832n(-259 + 2\gamma^2) + 16(19262 - 365\gamma^2 + 3\gamma^4)))/(45045(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{1,n,\gamma}(9, 6) & \equiv (32768n(7560 - 282n - 1871n^2 + 300n^3 + 70n^4 - 18n^5 + n^6)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-7722n^5 + 143n^6 - 52n^4(-3188 \\
& + 3\gamma^2) + 936n^3(-1921 + 6\gamma^2) + 16n^2(644489 - 4566\gamma^2 + 9\gamma^4) - 288n(102194 - 1407\gamma^2 + 9\gamma^4) - 64(-506388 + 12649\gamma^2 - 182\gamma^4 \\
& + \gamma^6)))/(45045(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma)) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma)) \\
& (n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{1,n,\gamma}(9, 8) & \equiv (32768n(45360 + 5868n - 11508n^2 - 71n^3 + 720n^4 - 38n^5 - 12n^6 + n^7)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-194480n^7 + 2431n^8 \\
& - 1768n^6(-3735 + 2\gamma^2) + 35360n^5(-3505 + 6\gamma^2) + 272n^4(5152539 - 19090\gamma^2 + 18\gamma^4) - 10880n^3(895039 - 6090\gamma^2 + 18\gamma^4) \\
& - 2176n^2(-18566720 + 213397\gamma^2 - 1345\gamma^4 + 2\gamma^6) + 43520n(-2089770 + 38897\gamma^2 - 445\gamma^4 + 2\gamma^6) + 256(329666256 - 9792160\gamma^2 \\
& + 187887\gamma^4 - 1830\gamma^6 + 7\gamma^8)))/(765765(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma)) \\
& (n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma)) \\
& (n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{1,n,\gamma}(9, 10) & \equiv (32768n(362880 + 92304n - 86196n^2 - 12076n^3 + 5689n^4 + 416n^5 - 134n^6 - 4n^7 + n^8)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8) \\
& (-5080790n^9 + 46189n^{10} - 83980n^8(-2929 + \gamma^2) + 3695120n^7(-1865 + 2\gamma^2) - 568480n^5(2596843 - 10510\gamma^2 + 18\gamma^4) \\
& + 5168n^6(23898289 - 54220\gamma^2 + 30\gamma^4) - 103360n^4(-114999823 + 757525\gamma^2 - 2710\gamma^4 + 2\gamma^6) + 4547840n^3(-13951150 \\
& + 141877\gamma^2 - 895\gamma^4 + 2\gamma^6) - 535040n(765411888 - 17281340\gamma^2 + 268127\gamma^4 - 2170\gamma^6 + 7\gamma^8) + 4864n^2(43992016756 \\
& - 670738690\gamma^2 + 6812255\gamma^4 - 31420\gamma^6 + 35\gamma^8) - 1024(-327585650400 + 10975521788\gamma^2 - 252722085\gamma^4 + 3314949\gamma^6 \\
& - 22715\gamma^8 + 63\gamma^{10}))/((14549535(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma)) \\
& (n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{1,n,\gamma}(11, 0) & \equiv -(262144(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2))/(693(-12 + n)(-10 + n) \\
& (-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma)) \\
& (n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \\
F_{1,n,\gamma}(11, 2) & \equiv -(262144n(-10395 + 9129n - 3010n^2 + 470n^3 - 35n^4 + n^5)(508 - 208n + 13n^2 - 4\gamma^2)(-14400 + 21076\gamma^2 - 7645\gamma^4 + 1023\gamma^6 \\
& - 55\gamma^8 + \gamma^{10}))/((9009(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{1,n,\gamma}(11, 4) & \equiv -(262144n(-20790 + 7863n + 3109n^2 - 2070n^3 + 400n^4 - 33n^5 + n^6)(-14400 + 21076\gamma^2 - 7645\gamma^4 + 1023\gamma^6 - 55\gamma^8 + \gamma^{10}) \\
& (-2340n^3 + 65n^4 + n^2(28220 - 40\gamma^2) + 720n(-179 + \gamma^2) + 16(11924 - 165\gamma^2 + \gamma^4)))/(45045(-16 + n)(-14 + n)(-12 + n)(-10 + n) \\
& (-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma) \\
& (n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{1,n,\gamma}(11, 6) & \equiv -(262144n(-83160 + 10662n + 20299n^2 - 5171n^3 - 470n^4 + 268n^5 - 29n^6 + n^7)(-14400 + 21076\gamma^2 - 7645\gamma^4 + 1023\gamma^6 - 55\gamma^8 \\
& + \gamma^{10})(-66300n^5 + 1105n^6 + 40800n^3(-452 + \gamma^2) - 340n^4(-4606 + 3\gamma^2) - 16320n(20759 - 210\gamma^2 + \gamma^4) + 272n^2(415277 - 2130\gamma^2 \\
& + 3\gamma^4) - 64(-6037596 + 111755\gamma^2 - 1204\gamma^4 + 5\gamma^6)))/(765765(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n) \\
& (-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)
\end{aligned}$$

$$\begin{aligned}
& (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(11,8) & \equiv -(262144n(-498960 - 19188n + 132456n^2 - 10727n^3 - 7991n^4 + 1138n^5 + 94n^6 - 23n^7 + n^8)(-14400 + 21076\gamma^2 - 7645\gamma^4 \\
& + 1023\gamma^6 - 55\gamma^8 + \gamma^{10})(-1847560n^7 + 20995n^8 - 12920n^6(-5311 + 2\gamma^2) + 568480n^5(-2461 + 3\gamma^2) - 454784n^3(278102 - 1380\gamma^2 \\
& + 3\gamma^4) + 5168n^4(3298669 - 8810\gamma^2 + 6\gamma^4) + 107008n(-12214716 + 169130\gamma^2 - 1459\gamma^4 + 5\gamma^6) - 2432n^2(-228117686 \\
& + 1932435\gamma^2 - 9089\gamma^4 + 10\gamma^6) + 1280(981726624 - 21861700\gamma^2 + 317919\gamma^4 - 2370\gamma^6 + 7\gamma^8)))/(14549535(-20+n)(-18+n) \\
& (-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(13,0) & \equiv (4194304(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2)) \\
& / (3003(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma) \\
& (-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))), \\
F_{1,n,\gamma}(13,2) & \equiv (4194304n(135135 - 129072n + 48259n^2 - 9120n^3 + 925n^4 - 48n^5 + n^6)(676 - 270n + 15n^2 - 4\gamma^2)(518400 - 773136\gamma^2 \\
& + 296296\gamma^4 - 44473\gamma^6 + 3003\gamma^8 - 91\gamma^{10} + \gamma^{12}))/ (45045(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{1,n,\gamma}(13,4) & \equiv (4194304n(270270 - 123009n - 32554n^2 + 30019n^3 - 7270n^4 + 829n^5 - 46n^6 + n^7)(518400 - 773136\gamma^2 + 296296\gamma^4 - 44473\gamma^6 \\
& + 3003\gamma^8 - 91\gamma^{10} + \gamma^{12})(-10200n^3 + 255n^4 - 68n^2(-1973 + 2\gamma^2) + 1360n(-473 + 2\gamma^2) + 48(20374 - 215\gamma^2 + \gamma^4)))/ (765765 \\
& (-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma)) \\
& (n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(13,6) & \equiv (4194304n(1081080 - 221766n - 253225n^2 + 87522n^3 + 939n^4 - 3954n^5 + 645n^6 - 42n^7 + n^8)(518400 - 773136\gamma^2 \\
& + 296296\gamma^4 - 44473\gamma^6 + 3003\gamma^8 - 91\gamma^{10} + \gamma^{12})(-106590n^5 + 1615n^6 - 1292n^4(-2124 + \gamma^2) + 28424n^3(-1223 + 2\gamma^2) \\
& + 304n^2(740765 - 2872\gamma^2 + 3\gamma^4) - 6688n(105152 - 815\gamma^2 + 3\gamma^4) - 320(-2576652 + 36799\gamma^2 - 308\gamma^4 + \gamma^6)))/ (4849845(-20+n) \\
& (-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(15,0) & \equiv -(33554432(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2) \\
& (-4+\gamma^2)(-1+\gamma^2))/ (6435(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{1,n,\gamma}(15,2) & \equiv -(33554432n(-2027025 + 2071215n - 852957n^2 + 185059n^3 - 22995n^4 + 1645n^5 - 63n^6 + n^7)(868 - 340n + 17n^2 - 4\gamma^2) \\
& (-25401600 + 38402064\gamma^2 - 15291640\gamma^4 + 2475473\gamma^6 - 191620\gamma^8 + 7462\gamma^{10} - 140\gamma^{12} + \gamma^{14}))/ (109395(-18+n)(-16+n) \\
& (-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\
& (n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(15,4) & \equiv -(33554432n(-4054050 + 2115405n + 365301n^2 - 482839n^3 + 139069n^4 - 19705n^5 + 1519n^6 - 61n^7 + n^8)(-25401600 \\
& + 38402064\gamma^2 - 15291640\gamma^4 + 2475473\gamma^6 - 191620\gamma^8 + 7462\gamma^{10} - 140\gamma^{12} + \gamma^{14})(-14212n^3 + 323n^4 + 3344n(-302 + \gamma^2) \\
& - 76n^2(-2661 + 2\gamma^2) + 16(98012 - 815\gamma^2 + 3\gamma^4)))/ (2078505(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n) \\
& (-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma) \\
& (-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma)) \\
& (n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(17,0) & \equiv (2147483648(-17+n)(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-64+\gamma^2)(-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2) \\
& (-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/ (109395(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
& (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{1,n,\gamma}(17,2) & \equiv (2147483648n(34459425 - 37237680n + 16571484n^2 - 3998960n^3 + 575974n^4 - 50960n^5 + 2716n^6 - 80n^7 + n^8)(1084 - 418n \\
& + 19n^2 - 4\gamma^2)(1625702400 - 2483133696\gamma^2 + 1017067024\gamma^4 - 173721912\gamma^6 + 14739153\gamma^8 - 669188\gamma^{10} + 16422\gamma^{12} - 204\gamma^{14} \\
& + \gamma^{16}))/ (2078505(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{1,n,\gamma}(19,0) & \equiv -(17179869184(-19+n)(-17+n)(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-81+\gamma^2)(-64+\gamma^2) \\
& (-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/ (230945(-20+n)(-18+n)(-16+n)(-14+n)(-12+n) \\
& (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)
\end{aligned}$$

$$(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma)))$$

for $n > 2\gamma + 20$.

Lemma 1.2. *We have*

$$F_{2,n,\gamma}(1, 0) \cong (-2+n)(-2+n+2\gamma)(n-2(1+\gamma))/4(-1+n),$$

$$F_{2,n,\gamma}(1, 8) \cong ((384+400n+140n^2+20n^3+n^4)(-10080n^7+315n^8-840n^6(-161+2\gamma^2)+20160n^5(-49+2\gamma^2)-16128n^3(689-130\gamma^2+6\gamma^4)+336n^4(12707-1190\gamma^2+18\gamma^4)+9216n(-1522+1085\gamma^2-203\gamma^4+10\gamma^6)-384n^2(-44158+16135\gamma^2-1617\gamma^4+30\gamma^6)+8960(576-820\gamma^2+273\gamma^4-30\gamma^6+\gamma^8)))/(1260(-8+n)(-6+n)(-4+n)(-1+n)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))),$$

$$F_{2,n,\gamma}(1, 10) \cong ((3840+4384n+1800n^2+340n^3+30n^4+n^5)(-34650n^9+693n^{10}-4620n^8(-163+\gamma^2)+92400n^7(-101+2\gamma^2)+3696n^6(19673-860\gamma^2+6\gamma^4)-36960n^5(10019-830\gamma^2+18\gamma^4)-10560n^4(-117571+17227\gamma^2-798\gamma^4+6\gamma^6)+211200n^3(-12746+3227\gamma^2-273\gamma^4+6\gamma^6)+2816n^2(1280124-564830\gamma^2+80619\gamma^4-3660\gamma^6+35\gamma^8)-28160n(96624-76580\gamma^2+17619\gamma^4-1410\gamma^6+35\gamma^8)-64512(-14400+21076\gamma^2-7645\gamma^4+1023\gamma^6-55\gamma^8+\gamma^{10}))/((2772(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),$$

$$F_{2,n,\gamma}(1, 12) \cong ((46080+56448n+25984n^2+5880n^3+700n^4+42n^5+n^6)(-216216n^{11}+3003n^{12}-12012n^{10}(-577+2\gamma^2)+720720n^9(-181+2\gamma^2)+144144n^8(11105-265\gamma^2+\gamma^4)-6918912n^7(1943-85\gamma^2+\gamma^4)+4942080n^5(-65713+7840\gamma^2-350\gamma^4+4\gamma^6)-27456n^6(-2874269+212072\gamma^2-5278\gamma^4+20\gamma^6)+36608n^4(25274544-4801895\gamma^2+352422\gamma^4-8310\gamma^6+35\gamma^8)-878592n^3(2016474-613655\gamma^2+70434\gamma^4-2910\gamma^6+35\gamma^8)-13312n^2(-162319536+81067448\gamma^2-14132811\gamma^4+937728\gamma^6-22715\gamma^8+126\gamma^{10})+159744n(-9528480+8105636\gamma^2-2107875\gamma^4+213048\gamma^6-8855\gamma^8+126\gamma^{10})+946176(518400-773136\gamma^2+296296\gamma^4-44473\gamma^6+3003\gamma^8-91\gamma^{10}+\gamma^{12}))/((12012(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),$$

$$F_{2,n,\gamma}(1, 14) \cong ((645120+836352n+420224n^2+108304n^3+15680n^4+1288n^5+56n^6+n^7)(-630630n^{13}+6435n^{14}-60060n^{12}(-466+\gamma^2)+2522520n^{11}(-295+2\gamma^2)-10090080n^9(16385-425\gamma^2+3\gamma^4)+48048n^{10}(274996-3970\gamma^2+9\gamma^4)-411840n^8(-3639646+154882\gamma^2-2296\gamma^4+5\gamma^6)+5765760n^7(-1729355+114632\gamma^2-3010\gamma^4+20\gamma^6)-53813760n^5(3218694-484115\gamma^2+31374\gamma^4-750\gamma^6+5\gamma^8)+256256n^6(190102809-19085230\gamma^2+809256\gamma^4-11100\gamma^6+25\gamma^8)+58705920n^3(-13062440+4519548\gamma^2-626945\gamma^4+35728\gamma^6-825\gamma^8+6\gamma^{10})-465920n^4(-942600840+213171145\gamma^2-20416638\gamma^4+775236\gamma^6-10450\gamma^8+27\gamma^{10})-860160n(674918208-604243640\gamma^2+170528358\gamma^4-19847685\gamma^6+1064063\gamma^8-25935\gamma^{10}+231\gamma^{12})+45056n^2(19322989488-10545480400\gamma^2+2094229137\gamma^4-172673670\gamma^6+6244420\gamma^8-90090\gamma^{10}+315\gamma^{12})-7028736(-25401600+38402064\gamma^2-15291640\gamma^4+2475473\gamma^6-191620\gamma^8+7462\gamma^{10}-140\gamma^{12}+\gamma^{14}))/((25740(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),$$

$$F_{2,n,\gamma}(1, 16) \cong ((10321920+14026752n+7559936n^2+2153088n^3+359184n^4+36288n^5+2184n^6+72n^7+n^8)(-14002560n^{15}+109395n^{16}-583440n^{14}(-1409+2\gamma^2)+65345280n^{13}(-449+2\gamma^2)+1633632n^{12}(435439-4090\gamma^2+6\gamma^4)-52276224n^{11}(237197-3950\gamma^2+18\gamma^4)-28005120n^{10}(-5728021+153755\gamma^2-1463\gamma^4+2\gamma^6)+448081920n^9(-3497801+142919\gamma^2-2387\gamma^4+10\gamma^6)-278806528n^7(236680323-20481500\gamma^2+820302\gamma^4-12300\gamma^6+50\gamma^8)+622336n^8(18728894229-1124811140\gamma^2+29958306\gamma^4-258900\gamma^6+350\gamma^8)-31682560n^6(-8914583982+1102483679\gamma^2-63955914\gamma^4+1511466\gamma^6-12485\gamma^8+18\gamma^{10})+506920960n^5(-1776706986+314678045\gamma^2-25815966\gamma^4+905982\gamma^6-12815\gamma^8+54\gamma^{10})+139264n^4(14998219423992-3850887420380\gamma^2+440323616733\gamma^4-22064937180\gamma^6+486000515\gamma^8-4086810\gamma^{10}+6930\gamma^{12})-4456448n^3(761308970616-289876847260\gamma^2+45829933149\gamma^4-3193055580\gamma^6+103218115\gamma^8-1466010\gamma^{10}+6930\gamma^{12})-3342336n^2(-1088056152000+635079474744\gamma^2-138311743570\gamma^4+13151664383\gamma^6-600012985\gamma^8+13145587\gamma^{10}-122045\gamma^{12}+286\gamma^{14})+53477376n(-43342084800+40343801784\gamma^2-12075713650\gamma^4+1546287743\gamma^6-96950425\gamma^8+3099187\gamma^{10}-48125\gamma^{12}+286\gamma^{14})+421724160(1625702400-2483133696\gamma^2+1017067024\gamma^4-173721912\gamma^6+14739153\gamma^8-669188\gamma^{10}+16422\gamma^{12}-204\gamma^{14}+\gamma^{16}))/((437580(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))),$$

$$F_{2,n,\gamma}(1, 18) \cong ((185794560+262803456n+150105600n^2+46315520n^3+8618400n^4+1012368n^5+75600n^6+3480n^7+90n^8+n^9)(-37413090n^{17}+230945n^{18}-2771340n^{16}(-1013+\gamma^2)+199536480n^{15}(-649+2\gamma^2)+4434144n^{14}(926859-5980\gamma^2+6\gamma^4)-558702144n^{13}(170319-1930\gamma^2+6\gamma^4)-5912192n^{12}(-281314303+5076645\gamma^2-32802\gamma^4+30\gamma^6)+638516736n^{11}(-35076571+948885\gamma^2-10689\gamma^4+30\gamma^6)+11824384n^{10}(19881750417-775372540\gamma^2+13802418\gamma^4-79800\gamma^6+70\gamma^8)-212838912n^9(9083363349-498083780\gamma^2+13178466\gamma^4-131700\gamma^6+350\gamma^8)+6501261312n^7(-9611031834$$

$$\begin{aligned}
& + 1005093705\gamma^2 - 52761126\gamma^4 + 1216710\gamma^6 - 11275\gamma^8 + 30\gamma^{10} - 12899328n^8(-965366841231 + 73339242735\gamma^2 \\
& - 2770280634\gamma^4 + 43372890\gamma^6 - 234850\gamma^8 + 210\gamma^{10}) + 2646016n^6(91304539760516 - 13158125130150\gamma^2 + 943017954879\gamma^4 \\
& - 30738733740\gamma^6 + 442086645\gamma^8 - 2364180\gamma^{10} + 2310\gamma^{12}) - 142884864n^5(4950218150024 - 991560269700\gamma^2 + 95964099231\gamma^4 \\
& - 4297524660\gamma^6 + 90195105\gamma^8 - 816270\gamma^{10} + 2310\gamma^{12}) - 10584064n^4(-144306091362024 + 40849402136972\gamma^2 \\
& - 5307929097471\gamma^4 + 320114583789\gamma^6 - 9406017335\gamma^8 + 130859001\gamma^{10} - 732270\gamma^{12} + 858\gamma^{14}) \\
& + 381026304n^3(-6138877682304 + 2518974907592\gamma^2 - 438584912766\gamma^4 + 35119965309\gamma^6 - 1403322635\gamma^8 + 28254681\gamma^{10} \\
& - 264495\gamma^{12} + 858\gamma^{14}) + 41091072n^2(58176701280000 - 35806103365344\gamma^2 + 8356272680600\gamma^4 - 879405345468\gamma^6 \\
& + 46796629555\gamma^8 - 1309887332\gamma^{10} + 18724650\gamma^{12} - 118456\gamma^{14} + 195\gamma^{16}) - 67239936n(21809929881600 - 20936377532928\gamma^2 \\
& + 6551960992720\gamma^4 - 899141659416\gamma^6 + 62760288305\gamma^8 - 2376281284\gamma^{10} + 49048230\gamma^{12} - 515372\gamma^{14} + 2145\gamma^{16}) \\
& - 3186360320(-131681894400 + 202759531776\gamma^2 - 84865562640\gamma^4 + 15088541896\gamma^6 - 1367593305\gamma^8 + 68943381\gamma^{10} \\
& - 1999370\gamma^{12} + 32946\gamma^{14} - 285\gamma^{16} + \gamma^{18}))/((923780(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (-1 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma) \\
& (-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))),
\end{aligned}$$

$$F_{2,n,\gamma}(3, 0) \cong -(2/3)(-1 + \gamma^2),$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 8) \cong & -((2(384 + 400n + 140n^2 + 20n^3 + n^4)(-1 + \gamma^2)(-46200n^7 + 1155n^8 - 1848n^6(-423 + 2\gamma^2) + 36960n^5(-197 + 3\gamma^2) \\
& - 21120n^3(6554 - 432\gamma^2 + 9\gamma^4) + 528n^4(76983 - 2614\gamma^2 + 18\gamma^4) + 28160n(-10620 + 2426\gamma^2 - 199\gamma^4 + 5\gamma^6) - 1408n^2(-197790 \\
& + 24127\gamma^2 - 1073\gamma^4 + 10\gamma^6) + 8960(14400 - 6676\gamma^2 + 969\gamma^4 - 54\gamma^6 + \gamma^8)))/(3465(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 10) \cong & -((2(3840 + 4384n + 1800n^2 + 340n^3 + 30n^4 + n^5)(-1 + \gamma^2)(-180180n^9 + 3003n^{10} - 12012n^8(-394 + \gamma^2) + 576576n^7(-124 \\
& + \gamma^2) + 6864n^6(99931 - 1744\gamma^2 + 6\gamma^4) - 247104n^5(17611 - 568\gamma^2 + 6\gamma^4) - 9152n^4(-2011464 + 111163\gamma^2 - 2468\gamma^4 + 10\gamma^6) \\
& + 219648n^3(-232110 + 21307\gamma^2 - 848\gamma^4 + 10\gamma^6) - 199680n(420768 - 110796\gamma^2 + 11557\gamma^4 - 488\gamma^6 + 7\gamma^8) \\
& + 3328n^2(26381808 - 4030464\gamma^2 + 265289\gamma^4 - 6400\gamma^6 + 35\gamma^8) - 64512(-518400 + 254736\gamma^2 - 41560\gamma^4 + 2913\gamma^6 - 90\gamma^8 \\
& + \gamma^{10}))/((9009(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma) \\
& (-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 12) \cong & -((2(46080 + 56448n + 25984n^2 + 5880n^3 + 700n^4 + 42n^5 + n^6)(-1 + \gamma^2)(-1261260n^{11} + 15015n^{12} + 5045040n^9(-209 + \gamma^2) \\
& - 12012n^{10}(-3949 + 6\gamma^2) + 102960n^8(149551 - 1523\gamma^2 + 3\gamma^4) - 2882880n^7(53857 - 988\gamma^2 + 6\gamma^4) + 3843840n^5(-1451799 \\
& + 69241\gamma^2 - 1550\gamma^4 + 10\gamma^6) - 9152n^6(-120785907 + 3657988\gamma^2 - 46370\gamma^4 + 100\gamma^6) - 1397760n^3(33969828 - 3842606\gamma^2 \\
& + 212907\gamma^4 - 4860\gamma^6 + 35\gamma^8) + 16640n^4(1186444320 - 87206113\gamma^2 + 3152078\gamma^4 - 41530\gamma^6 + 105\gamma^8) + 430080n(-149468256 \\
& + 43351852\gamma^2 - 5233685\gamma^4 + 285829\gamma^6 - 7035\gamma^8 + 63\gamma^{10}) - 1024n^2(-71463741552 + 12673135688\gamma^2 - 1044571315\gamma^4 \\
& + 37845020\gamma^6 - 545475\gamma^8 + 1890\gamma^{10}) + 946176(25401600 - 13000464\gamma^2 + 2291176\gamma^4 - 184297\gamma^6 + 7323\gamma^8 - 139\gamma^{10} + \gamma^{12}))/ \\
& (45045(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\
& (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 14) \cong & -((2(645120 + 836352n + 420224n^2 + 108304n^3 + 15680n^4 + 1288n^5 + 56n^6 + n^7)(-1 + \gamma^2)(-4084080n^{13} + 36465n^{14} \\
& - 204204n^{12}(-1019 + \gamma^2) + 6534528n^{11}(-977 + 3\gamma^2) - 28005120n^9(68701 - 788\gamma^2 + 3\gamma^4) + 116688n^{10}(1127639 - 7292\gamma^2 \\
& + 9\gamma^4) - 155584n^8(-132033477 + 2447053\gamma^2 - 19355\gamma^4 + 25\gamma^6) + 9957376n^7(-16302693 + 462157\gamma^2 - 6395\gamma^4 + 25\gamma^6) \\
& - 4526080n^5(906716256 - 55527466\gamma^2 + 1839074\gamma^4 - 25360\gamma^6 + 105\gamma^8) + 56576n^6(16818655776 - 706341318\gamma^2 \\
& + 15559246\gamma^4 - 124400\gamma^6 + 175\gamma^8) - 17408n^4(-733505086032 + 65337728088\gamma^2 - 3139328560\gamma^4 + 67974110\gamma^6 - 565075\gamma^8 \\
& + 945\gamma^{10}) + 557056n^3(-49642978896 + 6499980184\gamma^2 - 443220080\gamma^4 + 14226910\gamma^6 - 201075\gamma^8 + 945\gamma^{10}) \\
& - 23396352n(1374370560 - 427765024\gamma^2 + 57039296\gamma^4 - 3650762\gamma^6 + 118003\gamma^8 - 1844\gamma^{10} + 11\gamma^{12}) \\
& + 69632n^2(562269678336 - 110999054752\gamma^2 + 10610657472\gamma^4 - 486657042\gamma^6 + 10687663\gamma^8 - 99204\gamma^{10} + 231\gamma^{12}) \\
& - 7028736(-1625702400 + 857431296\gamma^2 - 159635728\gamma^4 + 14086184\gamma^6 - 652969\gamma^8 + 16219\gamma^{10} - 203\gamma^{12} + \gamma^{14}))/ \\
& (109395(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma)) \\
& (n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma)) \\
& (n - 2(7 + \gamma))(n - 2(8 + \gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 16) \cong & -((2(10321920 + 14026752n + 7559936n^2 + 2153088n^3 + 359184n^4 + 36288n^5 + 2184n^6 + 72n^7 + n^8)(-1 + \gamma^2)(-99768240n^{15} \\
& + 692835n^{16} + 558702144n^{13}(-479 + \gamma^2) - 2217072n^{14}(-2983 + 2\gamma^2) - 957775104n^{11}(154017 - 1180\gamma^2 + 3\gamma^4) \\
& + 4434144n^{12}(1666755 - 7274\gamma^2 + 6\gamma^4) - 11824384n^{10}(-185896587 + 2269873\gamma^2 - 11945\gamma^4 + 10\gamma^6) \\
& + 425677824n^9(-58502937 + 1073113\gamma^2 - 9815\gamma^4 + 25\gamma^6) - 1083543552n^7(1332389292 - 50020330\gamma^2 + 1071018\gamma^4 - 9600\gamma^6 \\
& + 25\gamma^8) + 1074944n^8(201302718285 - 5343456692\gamma^2 + 77066658\gamma^4 - 401700\gamma^6 + 350\gamma^8) + 142884864n^5(-197307462024 \\
& + 14422370836\gamma^2 - 613045560\gamma^4 + 12595170\gamma^6 - 112525\gamma^8 + 315\gamma^{10}) - 1323008n^6(-5557230805302 + 291521678363\gamma^2 \\
& - 8909505690\gamma^4 + 124625130\gamma^6 - 655025\gamma^8 + 630\gamma^{10}) - 190513152n^3(832336915104 - 121568162544\gamma^2 + 9576527132\gamma^4 \\
& - 381148882\gamma^6 + 7655963\gamma^8 - 71484\gamma^{10} + 231\gamma^{12}) + 2646016n^4(30042089536680 - 3079024859124\gamma^2 + 179032578511\gamma^4
\end{aligned}$$

$$\begin{aligned}
& -5190049364\gamma^6 + 71629201\gamma^8 - 398118\gamma^{10} + 462\gamma^{12} + 134479872n(-1212538118400 + 398360629152\gamma^2 - 57107232840\gamma^4 \\
& + 4075893164\gamma^6 - 156207995\gamma^8 + 3247041\gamma^{10} - 34265\gamma^{12} + 143\gamma^{14}) - 3735552n^2(-56151229665600 + 12025866107880\gamma^2 \\
& - 1277990929734\gamma^4 + 68538912781\gamma^6 - 1926656107\gamma^8 + 27593853\gamma^{10} - 174559\gamma^{12} + 286\gamma^{14}) + 421724160(131681894400 \\
& - 71077637376\gamma^2 + 13787925264\gamma^4 - 1300616632\gamma^6 + 66976673\gamma^8 - 1966708\gamma^{10} + 32662\gamma^{12} - 284\gamma^{14} + \gamma^{16})) \\
& / (2078505(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(3, 18) \cong & -(2(185794560 + 262803456n + 150105600n^2 + 46315520n^3 + 8618400n^4 + 1012368n^5 + 75600n^6 + 3480n^7 + 90n^8 + n^9) \\
& (-1 + \gamma^2)(-290990700n^{17} + 1616615n^{18} + 1862340480n^{15}(-674 + \gamma^2) - 3879876n^{16}(-6272 + 3\gamma^2) - 1862340480n^{13}(626541 \\
& - 3368\gamma^2 + 6\gamma^4) + 4434144n^{14}(10083623 - 31104\gamma^2 + 18\gamma^4) - 41385344n^{12}(-558015574 + 4735333\gamma^2 - 17408\gamma^4 + 10\gamma^6) \\
& + 4966241280n^{11}(-71280624 + 897733\gamma^2 - 5708\gamma^4 + 10\gamma^6) - 2257382400n^9(17864406069 - 444817072\gamma^2 + 6517614\gamma^4 \\
& - 40080\gamma^6 + 70\gamma^8) + 7524608n^{10}(565414361007 - 10148405816\gamma^2 + 101058442\gamma^4 - 362240\gamma^6 + 210\gamma^8) \\
& + 555663360n^7(-3189401652366 + 146276209241\gamma^2 - 4149395088\gamma^4 + 57860250\gamma^6 - 347900\gamma^8 + 630\gamma^{10}) \\
& - 992256n^8(-303978944135812 + 10321313998687\gamma^2 - 213447041116\gamma^4 + 2039381750\gamma^6 - 7212800\gamma^8 + 4410\gamma^{10}) \\
& + 18522112n^6(437264581437416 - 27013186931056\gamma^2 + 1030769448383\gamma^4 - 20111355304\gamma^6 + 186325671\gamma^8 - 674688\gamma^{10} \\
& + 462\gamma^{12}) - 1111326720n^5(25476414966216 - 2128005742356\gamma^2 + 107827996783\gamma^4 - 2858380304\gamma^6 + 38345671\gamma^8 \\
& - 233688\gamma^{10} + 462\gamma^{12}) + 1568931840n^3(-87726792427200 + 13955279111944\gamma^2 - 1223466741470\gamma^4 + 56575722659\gamma^6 \\
& - 1420773184\gamma^8 + 19035849\gamma^{10} - 123508\gamma^{12} + 286\gamma^{14}) - 4358144n^4(-16928148347992800 + 1932651308625496\gamma^2 \\
& - 129041114640980\gamma^4 + 4551549045931\gamma^6 - 84780560406\gamma^8 + 789646641\gamma^{10} - 3075072\gamma^{12} + 2574\gamma^{14}) \\
& - 247726080n(515765076480000 - 176878004793600\gamma^2 + 26798028720496\gamma^4 - 2071801577384\gamma^6 + 89357852903\gamma^8 \\
& - 2224625552\gamma^{10} + 31563686\gamma^{12} - 235664\gamma^{14} + 715\gamma^{16}) + 196608n^2(875436455594880000 - 199953344079408000\gamma^2 \\
& + 23015203369487248\gamma^4 - 1380907443083392\gamma^6 + 45783471046089\gamma^8 - 847603599976\gamma^{10} + 8362510618\gamma^{12} - 37669632\gamma^{14} \\
& + 45045\gamma^{16}) - 3186360320(-13168189440000 + 7239445632000\gamma^2 - 1449870163776\gamma^4 + 143849588464\gamma^6 - 7998283932\gamma^8 \\
& + 263647473\gamma^{10} - 5232908\gamma^{12} + 61062\gamma^{14} - 384\gamma^{16} + \gamma^{18}))/ (4849845(-20+n)(-18+n)(-16+n)(-14+n)(-12+n) \\
& (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\
& (n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(5, 6) \cong & (32(-144 - 84n + 8n^2 + 9n^3 + n^4)(4 - 5\gamma^2 + \gamma^4)(-6930n^5 + 231n^6 + 3960n^3(-123 + 2\gamma^2) - 132n^4(-622 + 3\gamma^2) + 528n^2(2845 \\
& - 112\gamma^2 + \gamma^4) - 5280n(420 - 37\gamma^2 + \gamma^4) - 320(-3600 + 769\gamma^2 - 50\gamma^4 + \gamma^6)))/(3465(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(5, 8) \cong & (32(-1152 - 816n - 20n^2 + 80n^3 + 17n^4 + n^5)(4 - 5\gamma^2 + \gamma^4)(-144144n^7 + 3003n^8 - 3432n^6(-851 + 2\gamma^2) + 123552n^5(-263 \\
& + 2\gamma^2) + 6864n^4(31447 - 534\gamma^2 + 2\gamma^4) - 164736n^3(5275 - 174\gamma^2 + 2\gamma^4) + 99840n(-25020 + 2891\gamma^2 - 133\gamma^4 + 2\gamma^6) \\
& - 1664n^2(-1226970 + 75043\gamma^2 - 1853\gamma^4 + 10\gamma^6) + 8960(129600 - 31284\gamma^2 + 2569\gamma^4 - 86\gamma^6 + \gamma^8)))/(45045(-12+n) \\
& (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
& (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(5, 10) \cong & (32(-11520 - 9312n - 1016n^2 + 780n^3 + 250n^4 + 27n^5 + n^6)(4 - 5\gamma^2 + \gamma^4)(-210210n^9 + 3003n^{10} - 8580n^8(-751 + \gamma^2) \\
& + 240240n^7(-473 + 2\gamma^2) - 480480n^5(19615 - 330\gamma^2 + 2\gamma^4) + 2288n^6(556323 - 5080\gamma^2 + 10\gamma^4) - 4160n^4(-11166141 \\
& + 320717\gamma^2 - 4086\gamma^4 + 10\gamma^6) + 116480n^3(-1281420 + 60919\gamma^2 - 1391\gamma^4 + 10\gamma^6) - 17920n(17784144 - 2432640\gamma^2 \\
& + 146075\gamma^4 - 3790\gamma^6 + 35\gamma^8) + 256n^2(1154318508 - 91170310\gamma^2 + 3443995\gamma^4 - 50800\gamma^6 + 175\gamma^8) - 21504(-6350400 \\
& + 1662516\gamma^2 - 157165\gamma^4 + 6783\gamma^6 - 135\gamma^8 + \gamma^{10}))/ (45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(5, 12) \cong & (32(-138240 - 123264n - 21504n^2 + 8344n^3 + 3780n^4 + 574n^5 + 39n^6 + n^7)(4 - 5\gamma^2 + \gamma^4)(-4900896n^{11} + 51051n^{12} \\
& + 7001280n^9(-767 + 2\gamma^2) - 29172n^{10}(-7229 + 6\gamma^2) + 116688n^8(770901 - 4265\gamma^2 + 5\gamma^4) - 7468032n^7(139509 - 1385\gamma^2 + 5\gamma^4) \\
& + 3394560n^5(-14591703 + 373012\gamma^2 - 4938\gamma^4 + 20\gamma^6) - 14144n^6(-603024051 + 9838564\gamma^2 - 73970\gamma^4 + 100\gamma^6) \\
& - 417792n^3(1329082188 - 79727515\gamma^2 + 2596330\gamma^4 - 37150\gamma^6 + 175\gamma^8) + 4352n^4(46287723588 - 1813667665\gamma^2 + 38643710\gamma^4 \\
& - 319450\gamma^6 + 525\gamma^8) + 5849088n(-163517760 + 25137136\gamma^2 - 1781265\gamma^4 + 60948\gamma^6 - 985\gamma^8 + 6\gamma^{10}) - 17408n^2(-55922884416 \\
& + 5241234160\gamma^2 - 253421285\gamma^4 + 5750308\gamma^6 - 54285\gamma^8 + 126\gamma^{10}) + 946176(406425600 - 112751424\gamma^2 + 11721076\gamma^4 \\
& - 591277\gamma^6 + 15423\gamma^8 - 199\gamma^{10} + \gamma^{12}))/ (765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))),
\end{aligned}$$

$$F_{2,n,\gamma}(5, 14) \cong (32(-1935360 - 1863936n - 424320n^2 + 95312n^3 + 61264n^4 + 11816n^5 + 1120n^6 + 53n^7 + n^8)(4 - 5\gamma^2 + \gamma^4)(-17459442n^{13}$$

$$\begin{aligned}
& + 138567n^{14} - 554268n^{12}(-1808 + \gamma^2) + 29930472n^{11}(-1159 + 2\gamma^2) + 2217072n^{10}(364452 - 1320\gamma^2 + \gamma^4) - 39907296n^9(335181 \\
& - 2145\gamma^2 + 5\gamma^4) - 268736n^8(-602765832 + 6205834\gamma^2 - 29960\gamma^4 + 25\gamma^6) + 4837248n^7(-300663003 + 4711684\gamma^2 - 39650\gamma^4 \\
& + 100\gamma^6) + 82688n^6(117312982467 - 2708743060\gamma^2 + 36141192\gamma^4 - 186000\gamma^6 + 175\gamma^8) - 4465152n^5(10671095076 \\
& - 357150115\gamma^2 + 7133850\gamma^4 - 63150\gamma^6 + 175\gamma^8) - 330752n^4(-510387021252 + 24690363037\gamma^2 - 712318740\gamma^4 + 9872004\gamma^6 \\
& - 54880\gamma^8 + 63\gamma^{10}) + 5953536n^3(-69762284928 + 4930635200\gamma^2 - 201058365\gamma^4 + 4119108\gamma^6 - 38885\gamma^8 + 126\gamma^{10}) \\
& - 9805824n(61815467520 - 10358813376\gamma^2 + 823017548\gamma^4 - 33499333\gamma^6 + 721799\gamma^8 - 7791\gamma^{10} + 33\gamma^{12}) \\
& + 77824n^2(8528427392832 - 904906497168\gamma^2 + 51574668809\gamma^4 - 1506194764\gamma^6 + 22065428\gamma^8 - 141288\gamma^{10} + 231\gamma^{12}) \\
& - 7028736(-32920473600 + 9539290944\gamma^2 - 1062158580\gamma^4 + 59614513\gamma^6 - 1840540\gamma^8 + 31542\gamma^{10} - 280\gamma^{12} + \gamma^{14})) \\
& / (2078505(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{2,n,\gamma}(5, 16) & \cong (32(-30965760 - 31758336n - 8653056n^2 + 1100672n^3 + 1075536n^4 + 250320n^5 + 29736n^6 + 1968n^7 + 69n^8 + n^9)(4 - 5\gamma^2 \\
& + \gamma^4)(-155195040n^{15} + 969969n^{16} - 2217072n^{14}(-5163 + 2\gamma^2) + 310390080n^{13}(-1663 + 2\gamma^2) + 10346336n^{12}(1537977 \\
& - 3854\gamma^2 + 2\gamma^4) - 1241560320n^{11}(286077 - 1254\gamma^2 + 2\gamma^4) - 7524608n^{10}(-788115171 + 5484029\gamma^2 - 18045\gamma^4 + 10\gamma^6) \\
& + 752460800n^9(-100248321 + 1043329\gamma^2 - 5945\gamma^4 + 10\gamma^6) - 46305280n^7(119758429749 - 2524969532\gamma^2 + 33399306\gamma^4 \\
& - 196500\gamma^6 + 350\gamma^8) + 82688n^8(8917707231243 - 133657783724\gamma^2 + 1196120142\gamma^4 - 4105500\gamma^6 + 2450\gamma^8) \\
& - 9261056n^6(-3443084705166 + 100837560681\gamma^2 - 1894928470\gamma^4 + 17336526\gamma^6 - 62195\gamma^8 + 42\gamma^{10}) \\
& + 185221120n^5(-746187033348 + 30255515843\gamma^2 - 786878310\gamma^4 + 10534578\gamma^6 - 64085\gamma^8 + 126\gamma^{10}) \\
& + 1089536n^4(404341252288200 - 22832243767092\gamma^2 + 808275886599\gamma^4 - 15210885524\gamma^6 + 142574201\gamma^8 - 556038\gamma^{10} \\
& + 462\gamma^{12}) - 43581440n^3(22752364687200 - 1818916058592\gamma^2 + 86833031599\gamma^4 - 2235414524\gamma^6 + 30416701\gamma^8 - 199038\gamma^{10} \\
& + 462\gamma^{12}) + 27525120n(-46005032160000 + 8240859712800\gamma^2 - 712363004892\gamma^4 + 32717809201\gamma^6 - 845865361\gamma^8 \\
& + 12292413\gamma^{10} - 93247\gamma^{12} + 286\gamma^{14}) - 196608n^2(-7484779770120000 + 873173911300200\gamma^2 - 56031193128694\gamma^4 \\
& + 1937676382607\gamma^6 - 36810753077\gamma^8 + 368977791\gamma^{10} - 1676829\gamma^{12} + 2002\gamma^{14}) + 140574720(3292047360000 \\
& - 986849568000\gamma^2 + 115755148944\gamma^4 - 7023609880\gamma^6 + 243668513\gamma^8 - 4994740\gamma^{10} + 59542\gamma^{12} - 380\gamma^{14} + \gamma^{16})) \\
& / (14549535(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma)) \\
& (n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{2,n,\gamma}(7, 4) & \cong -((256(120 + 26n - 25n^2 - 2n^3 + n^4)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-1980n^3 + 99n^4 + 880n(-34 + \gamma^2) - 44n^2(-293 + 2\gamma^2) + 48(400 \\
& - 41\gamma^2 + \gamma^4)))/(3465(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))), \\
F_{2,n,\gamma}(7, 6) & \cong -((256(720 + 276n - 124n^2 - 37n^3 + 4n^4 + n^5)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-15444n^5 + 429n^6 - 572n^4(-379 + \gamma^2) \\
& + 13728n^3(-109 + \gamma^2) + 208n^2(25180 - 574\gamma^2 + 3\gamma^4) - 2496n(3400 - 178\gamma^2 + 3\gamma^4) - 320(-14400 + 1876\gamma^2 - 77\gamma^4 + \gamma^6)) \\
& / (15015(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma) \\
& (n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \\
F_{2,n,\gamma}(7, 8) & \cong -((256(5760 + 2928n - 716n^2 - 420n^3 - 5n^4 + 12n^5 + n^6)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-72072n^7 + 1287n^8 + 96096n^5(-226 \\
& + \gamma^2) - 1144n^6(-1481 + 2\gamma^2) - 104832n^3(7143 - 140\gamma^2 + \gamma^4) + 208n^4(792083 - 7910\gamma^2 + 18\gamma^4) + 10752n(-241780 + 17037\gamma^2 \\
& - 502\gamma^4 + 5\gamma^6) - 128n^2(-15277402 + 561499\gamma^2 - 8745\gamma^4 + 30\gamma^6) + 1792(705600 - 106324\gamma^2 + 5649\gamma^4 - 126\gamma^6 + \gamma^8)) \\
& / (45045(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\
& (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{2,n,\gamma}(7, 10) & \cong -((256(57600 + 35040n - 4232n^2 - 4916n^3 - 470n^4 + 115n^5 + 22n^6 + n^7)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6)(-1750320n^9 + 21879n^{10} \\
& - 48620n^8(-1258 + \gamma^2) + 3111680n^7(-394 + \gamma^2) - 282880n^5(458981 - 4676\gamma^2 + 18\gamma^4) + 3536n^6(4398547 - 24220\gamma^2 + 30\gamma^4) \\
& - 5440n^4(-131847908 + 2303057\gamma^2 - 18768\gamma^4 + 30\gamma^6) + 174080n^3(-14721028 + 427729\gamma^2 - 6288\gamma^4 + 30\gamma^6) \\
& - 2437120n(2665152 - 226720\gamma^2 + 8895\gamma^4 - 156\gamma^6 + \gamma^8) + 4352n^2(1281467712 - 62274080\gamma^2 + 1524765\gamma^4 - 15060\gamma^6 + 35\gamma^8) \\
& - 64512(-45158400 + 7510336\gamma^2 - 467860\gamma^4 + 13713\gamma^6 - 190\gamma^8 + \gamma^{10}))/ (765765(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n) \\
& (-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{2,n,\gamma}(7, 12) & \cong -((256(691200 + 478080n - 15744n^2 - 63224n^3 - 10556n^4 + 910n^5 + 379n^6 + 34n^7 + n^8)(-36 + 49\gamma^2 - 14\gamma^4 + \gamma^6) \\
& (-14965236n^{11} + 138567n^{12} + 33256080n^9(-622 + \gamma^2) - 184756n^{10}(-3917 + 2\gamma^2) + 201552n^8(1927033 - 6585\gamma^2 + 5\gamma^4) \\
& - 7255872n^7(693689 - 4260\gamma^2 + 10\gamma^4) + 11162880n^5(-26633424 + 422371\gamma^2 - 3656\gamma^4 + 10\gamma^6) - 20672n^6(-2225210133 \\
& + 22489048\gamma^2 - 110270\gamma^4 + 100\gamma^6) + 82688n^4(16204767884 - 394635875\gamma^2 + 5512070\gamma^4 - 30910\gamma^6 + 35\gamma^8) \\
& - 2976768n^3(1366642592 - 51092600\gamma^2 + 1093925\gamma^4 - 10660\gamma^6 + 35\gamma^8) + 4902912n(-1677231360 + 162831104\gamma^2 - 7655960\gamma^4 \\
& + 179857\gamma^6 - 2050\gamma^8 + 9\gamma^{10}) - 19456n^2(-400069720512 + 23474882128\gamma^2 - 749106415\gamma^4 + 11619968\gamma^6 - 76895\gamma^8 + 126\gamma^{10}))
\end{aligned}$$

$$\begin{aligned}
& + 946176(3657830400 - 653495616\gamma^2 + 45406996\gamma^4 - 1578613\gamma^6 + 29103\gamma^8 - 271\gamma^{10} + \gamma^{12}))/ (4849845(-18+n)(-16+n) \\
& (-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\
& (n-2(8+\gamma))(n-2(9+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(7, 14) \cong & -((256(9676800 + 7384320n + 257664n^2 - 900880n^3 - 211008n^4 + 2184n^5 + 6216n^6 + 855n^7 + 48n^8 + n^9)(-36 + 49\gamma^2 - 14\gamma^4 \\
& + \gamma^6)(-58198140n^{13} + 415701n^{14} - 1293292n^{12}(-2869 + \gamma^2) + 155195040n^{11}(-919 + \gamma^2) - 423259200n^9(159999 - 646\gamma^2 + \gamma^4) \\
& + 470288n^{10}(7840891 - 17914\gamma^2 + 9\gamma^4) + 34728960n^7(-260286537 + 2573593\gamma^2 - 14405\gamma^4 + 25\gamma^6) - 62016n^8(-14659756009 \\
& + 95228651\gamma^2 - 305585\gamma^4 + 175\gamma^6) + 578816n^6(115176140776 - 1678032936\gamma^2 + 14899806\gamma^4 - 52860\gamma^6 + 35\gamma^8) \\
& - 34728960n^5(10402798976 - 219742736\gamma^2 + 2922806\gamma^4 - 17860\gamma^6 + 35\gamma^8) + 16343040n^3(-231841823808 + 10364627960\gamma^2 \\
& - 282089570\gamma^4 + 3999994\gamma^6 - 26845\gamma^8 + 63\gamma^{10}) - 136192n^4(-10334647089424 + 315744841880\gamma^2 - 6071244210\gamma^4 \\
& + 58154982\gamma^6 - 229285\gamma^8 + 189\gamma^{10}) - 5160960n(1246874342400 - 133596867712\gamma^2 + 7129710896\gamma^4 - 201727064\gamma^6 \\
& + 3104101\gamma^8 - 24458\gamma^{10} + 77\gamma^{12}) + 4096n^2(1604950293830400 - 108075873789856\gamma^2 + 4121083799448\gamma^4 - 83451265632\gamma^6 \\
& + 870998863\gamma^8 - 4054554\gamma^{10} + 4851\gamma^{12}) - 7028736(-365783040000 + 69007392000\gamma^2 - 5194195216\gamma^4 + 203268296\gamma^6 \\
& - 4488913\gamma^8 + 56203\gamma^{10} - 371\gamma^{12} + \gamma^{14}))/ (14549535(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n) \\
& (-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma) \\
& (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma)) \\
& (n-2(10+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 0) \cong & (8192(-7+n)(-5+n)(-3+n)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/ (315(-8+n)(-6+n)(-4+n)(-8+n+2\gamma)(-6+n+2\gamma) \\
& (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 2) \cong & (8192(-210 + 37n + 41n^2 - 13n^3 + n^4)(100 - 110n + 11n^2 - 4\gamma^2)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8))/ (3465(-10+n)(-8+n) \\
& (-6+n)(-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 4) \cong & (8192(-840 - 62n + 201n^2 - 11n^3 - 9n^4 + n^5)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-3432n^3 + 143n^4 - 52n^2(-501 + 2\gamma^2) \\
& + 624n(-105 + 2\gamma^2) + 48(900 - 61\gamma^2 + \gamma^4)))/ (45045(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 6) \cong & (8192(-5040 - 1212n + 1144n^2 + 135n^3 - 65n^4 - 3n^5 + n^6)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-6006n^5 + 143n^6 \\
& + 2184n^3(-347 + 2\gamma^2) - 52n^4(-1868 + 3\gamma^2) - 672n(7510 - 261\gamma^2 + 3\gamma^4) + 16n^2(182417 - 2694\gamma^2 + 9\gamma^4) - 64(-44100 + 3889\gamma^2 \\
& - 110\gamma^4 + \gamma^6)))/ (45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 8) \cong & (8192(-40320 - 14736n + 7940n^2 + 2224n^3 - 385n^4 - 89n^5 + 5n^6 + n^7)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-155584n^7 \\
& + 2431n^8 - 1768n^6(-2349 + 2\gamma^2) + 28288n^5(-2119 + 6\gamma^2) + 272n^4(1862499 - 12070\gamma^2 + 18\gamma^4) - 8704n^3(290851 - 3750\gamma^2 \\
& + 18\gamma^4) - 2176n^2(-3286934 + 80557\gamma^2 - 859\gamma^4 + 2\gamma^6) + 34816n(-289590 + 13805\gamma^2 - 283\gamma^4 + 2\gamma^6) + 1792(2822400 \\
& - 292996\gamma^2 + 10929\gamma^4 - 174\gamma^6 + \gamma^8)))/ (765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 10) \cong & (8192(-403200 - 187680n + 64664n^2 + 30180n^3 - 1626n^4 - 1275n^5 - 39n^6 + 15n^7 + n^8)(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8) \\
& (-4157010n^9 + 46189n^{10} - 83980n^8(-1939 + \gamma^2) + 3023280n^7(-1205 + 2\gamma^2) - 1395360n^5(338785 - 2290\gamma^2 + 6\gamma^4) \\
& + 5168n^6(9929789 - 36020\gamma^2 + 30\gamma^4) - 103360n^4(-27672873 + 323025\gamma^2 - 1810\gamma^4 + 2\gamma^6) + 3720960n^3(-2980590 + 58317\gamma^2 \\
& - 595\gamma^4 + 2\gamma^6) - 437760n(72775584 - 4251180\gamma^2 + 117847\gamma^4 - 1490\gamma^6 + 7\gamma^8) + 4864n^2(5323374756 - 175713990\gamma^2 \\
& + 3012755\gamma^4 - 21220\gamma^6 + 35\gamma^8) - 64512(-228614400 + 26555076\gamma^2 - 1178245\gamma^4 + 25023\gamma^6 - 255\gamma^8 + \gamma^{10}))) \\
& / (14549535(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(9, 12) \cong & 1743n^6 + 141n^7 + 27n^8 + n^9(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)(-5542680n^{11} + 46189n^{12} + 5038800n^9(-1865 + 2\gamma^2) \\
& - 16796n^{10}(-17695 + 6\gamma^2) + 15504n^8(12555263 - 28735\gamma^2 + 15\gamma^4) - 1240320n^7(2236513 - 9235\gamma^2 + 15\gamma^4) \\
& - 20672n^6(-1343492665 + 9165344\gamma^2 - 31270\gamma^4 + 20\gamma^6) + 1240320n^5(-157824465 + 1696344\gamma^2 - 10270\gamma^4 + 20\gamma^6) \\
& - 583680n^3(5359735002 - 137110815\gamma^2 + 2074610\gamma^4 - 14590\gamma^6 + 35\gamma^8) + 4864n^4(196707711256 - 3261144445\gamma^2 \\
& + 32021330\gamma^4 - 128770\gamma^6 + 105\gamma^8) + 184320n(-38576865600 + 2602881028\gamma^2 - 87543005\gamma^4 + 1501456\gamma^6 - 12705\gamma^8 \\
& + 42\gamma^{10}) - 1024n^2(-6237818326800 + 252072014752\gamma^2 - 5717114045\gamma^4 + 64376104\gamma^6 - 313845\gamma^8 + 378\gamma^{10}) \\
& + 135168(22861440000 - 2884122000\gamma^2 + 144379576\gamma^4 - 3680545\gamma^6 + 50523\gamma^8 - 355\gamma^{10} + \gamma^{12}))/ (14549535(-20+n) \\
& (-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\
& (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(11, 0) \cong & -((65536(-9+n)(-7+n)(-5+n)(-3+n)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/ (693(-10+n)(-8+n)(-6+n)
\end{aligned}$$

$$\begin{aligned}
& (-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))), \\
F_{2,n,\gamma}(11,2) & \cong -((65536(1890-543n-332n^2+158n^3-22n^4+n^5)(144-156n+13n^2-4\gamma^2)(-14400+21076\gamma^2-7645\gamma^4+1023\gamma^6-55\gamma^8 \\
& +\gamma^{10}))/((9009(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\
& (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)))), \\
F_{2,n,\gamma}(11,4) & \cong -((65536(7560-282n-1871n^2+300n^3+70n^4-18n^5+n^6)(-14400+21076\gamma^2-7645\gamma^4+1023\gamma^6-55\gamma^8+\gamma^{10})(-1820n^3 \\
& +65n^4+560n(-75+\gamma^2)-20n^2(-787+2\gamma^2)+16(1764-85\gamma^2+\gamma^4)))/(45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n) \\
& (-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))), \\
F_{2,n,\gamma}(11,6) & \cong -((65536(45360+5868n-11508n^2-71n^3+720n^4-38n^5-12n^6+n^7)(-14400+21076\gamma^2-7645\gamma^4+1023\gamma^6-55\gamma^8 \\
& +\gamma^{10})(-53040n^5+1105n^6+32640n^3(-257+\gamma^2)-340n^4(-2851+3\gamma^2)-13056n(4844-120\gamma^2+\gamma^4)+272n^2(128132 \\
& -1320\gamma^2+3\gamma^4)-320(-112896+7204\gamma^2-149\gamma^4+\gamma^6)))/(765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n) \\
& (-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
& (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{2,n,\gamma}(11,8) & \cong -((65536(362880+92304n-86196n^2-12076n^3+5689n^4+416n^5-134n^6-4n^7+n^8)(-14400+21076\gamma^2-7645\gamma^4 \\
& +1023\gamma^6-55\gamma^8+\gamma^{10})(-1511640n^7+20995n^8+1395360n^5(-517+\gamma^2)-12920n^6(-3491+2\gamma^2)-372096n^3(96952 \\
& -880\gamma^2+3\gamma^4)+5168n^4(1292669-5810\gamma^2+6\gamma^4)+87552n(-1823976+62880\gamma^2-949\gamma^4+5\gamma^6)-2432n^2(-44575146 \\
& +779835\gamma^2-6029\gamma^4+10\gamma^6)+8960(9144576-696420\gamma^2+19273\gamma^4-230\gamma^6+\gamma^8)))/(14549535(-18+n)(-16+n) \\
& (-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\
& (n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{2,n,\gamma}(11,10) & \cong -((65536(3628800+1285920n-769656n^2-206956n^3+44814n^4+9849n^5-924n^6-174n^7+6n^8+n^9)(-14400+21076\gamma^2 \\
& -7645\gamma^4+1023\gamma^6-55\gamma^8+\gamma^{10})(-419900n^9+4199n^{10}-6460n^8(-2818+\gamma^2)+516800n^7(-868+\gamma^2)+5168n^6(1338857 \\
& -3400\gamma^2+2\gamma^4)-103360n^5(670571-3200\gamma^2+6\gamma^4)-6080n^4(-74392576+618231\gamma^2-2508\gamma^4+2\gamma^6) \\
& +243200n^3(-7704126+108231\gamma^2-808\gamma^4+2\gamma^6)+256n^2(18052910640-431678840\gamma^2+5468369\gamma^4-28760\gamma^6+35\gamma^8) \\
& -5120n(1157768640-49484340\gamma^2+1022369\gamma^4-9760\gamma^6+35\gamma^8)-3072(-914457600+78786576\gamma^2-2623720\gamma^4 \\
& +42273\gamma^6-330\gamma^8+\gamma^{10}))/((2909907(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n) \\
& (n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma) \\
& (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma)) \\
& (n-2(10+\gamma))), \\
F_{2,n,\gamma}(13,0) & \cong (1048576(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2) \\
& /((3003(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\
& (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))), \\
F_{2,n,\gamma}(13,2) & \cong (1048576(-20790+7863n+3109n^2-2070n^3+400n^4-33n^5+n^6)(196-210n+15n^2-4\gamma^2)(518400-773136\gamma^2 \\
& +296296\gamma^4-44473\gamma^6+3003\gamma^8-91\gamma^{10}+\gamma^{12}))/((45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma)) \\
& (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
& (n-2(6+\gamma))(n-2(7+\gamma))), \\
F_{2,n,\gamma}(13,4) & \cong (1048576(-83160+10662n+20299n^2-5171n^3-470n^4+268n^5-29n^6+n^7)(518400-773136\gamma^2+296296\gamma^4-44473\gamma^6 \\
& +3003\gamma^8-91\gamma^{10}+\gamma^{12})(-8160n^3+255n^4-68n^2(-1163+2\gamma^2)+1088n(-203+2\gamma^2)+48(3136-113\gamma^2+\gamma^4)) \\
& /((765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\
& (n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{2,n,\gamma}(13,6) & \cong (1048576(-498960-19188n+132456n^2-10727n^3-7991n^4+1138n^5+94n^6-23n^7+n^8)(518400-773136\gamma^2 \\
& +296296\gamma^4-44473\gamma^6+3003\gamma^8-91\gamma^{10}+\gamma^{12})(-87210n^5+1615n^6-1292n^4(-1374+\gamma^2)+23256n^3(-723+2\gamma^2) \\
& +304n^2(244535-1852\gamma^2+3\gamma^4)-5472n(25592-475\gamma^2+3\gamma^4)-320(-254016+12289\gamma^2-194\gamma^4+\gamma^6)) \\
& /((4849845(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{2,n,\gamma}(13,8) & \cong (1048576(-3991680-652464n+1040460n^2+46640n^3-74655n^4+1113n^5+1890n^6-90n^7-15n^8+n^9)(518400 \\
& -773136\gamma^2+296296\gamma^4-44473\gamma^6+3003\gamma^8-91\gamma^{10}+\gamma^{12})(-387600n^7+4845n^8-2584n^6(-4943+2\gamma^2)+155040n^5(-1443 \\
& +2\gamma^2)-36480n^3(354481-2378\gamma^2+6\gamma^4)+304n^4(7378943-24134\gamma^2+18\gamma^4)+7680n(-8110200+211867\gamma^2-2453\gamma^4+10\gamma^6) \\
& -128n^2(-319156450+4182901\gamma^2-24459\gamma^4+30\gamma^6)+1280(25401600-1482916\gamma^2+31689\gamma^4-294\gamma^6+\gamma^8)) \\
& /((14549535(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
& (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
& (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{2,n,\gamma}(15,0) &\cong -((8388608(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2) \\
&\quad (-1+\gamma^2))/(6435(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma) \\
&\quad (-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))), \\
F_{2,n,\gamma}(15,2) &\cong -((8388608(270270-123009n-32554n^2+30019n^3-7270n^4+829n^5-46n^6+n^7)(256-272n+17n^2-4\gamma^2)(-25401600 \\
&\quad +38402064\gamma^2-15291640\gamma^4+2475473\gamma^6-191620\gamma^8+7462\gamma^{10}-140\gamma^{12}+\gamma^{14}))(109395(-16+n)(-14+n)(-12+n)(-10+n) \\
&\quad (-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\
&\quad (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{2,n,\gamma}(15,4) &\cong -((8388608(1081080-221766n-253225n^2+87522n^3+939n^4-3954n^5+645n^6-42n^7+n^8)(-25401600+38402064\gamma^2 \\
&\quad -15291640\gamma^4+2475473\gamma^6-191620\gamma^8+7462\gamma^{10}-140\gamma^{12}+\gamma^{14})(-11628n^3+323n^4+2736n(-132+\gamma^2)-76n^2(-1641+2\gamma^2) \\
&\quad +48(5184-145\gamma^2+\gamma^4)))/(2078505(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma)) \\
&\quad (n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
&\quad (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{2,n,\gamma}(15,6) &\cong -((8388608(6486480-249516n-1741116n^2+271907n^3+93156n^4-22785n^5-84n^6+393n^7-36n^8+n^9)(-25401600 \\
&\quad +38402064\gamma^2-15291640\gamma^4+2475473\gamma^6-191620\gamma^8+7462\gamma^{10}-140\gamma^{12}+\gamma^{14})(-135660n^5+2261n^6+63840n^3(-489+\gamma^2) \\
&\quad -532n^4(-5717+3\gamma^2)-20160n(14000-202\gamma^2+\gamma^4)+112n^2(1298300-7518\gamma^2+9\gamma^4)-320(-518400+19684\gamma^2-245\gamma^4+\gamma^6))) \\
&\quad /((14549535(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\
&\quad (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma)) \\
&\quad (n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{2,n,\gamma}(17,0) &\cong (536870912(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-64+\gamma^2)(-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2) \\
&\quad (-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/(109395(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
&\quad (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
&\quad (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))), \\
F_{2,n,\gamma}(17,2) &\cong (536870912(-4054050+2115405n+365301n^2-482839n^3+139069n^4-19705n^5+1519n^6-61n^7+n^8)(324-342n+19n^2 \\
&\quad -4\gamma^2)(1625702400-2483133696\gamma^2+1017067024\gamma^4-173721912\gamma^6+14739153\gamma^8-669188\gamma^{10}+16422\gamma^{12}-204\gamma^{14}+\gamma^{16})) \\
&\quad /((2078505(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma)) \\
&\quad (n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma)) \\
&\quad (n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{2,n,\gamma}(17,4) &\cong (536870912(-16216200+4407570n+3576609n^2-1566055n^3+73437n^4+60249n^5-13629n^6+1275n^7-57n^8+n^9) \\
&\quad (1625702400-2483133696\gamma^2+1017067024\gamma^4-173721912\gamma^6+14739153\gamma^8-669188\gamma^{10}+16422\gamma^{12}-204\gamma^{14}+\gamma^{16})(-5320n^3 \\
&\quad +133n^4+n^2(62524-56\gamma^2)+560n(-333+2\gamma^2)+16(8100-181\gamma^2+\gamma^4)))/(14549535(-20+n)(-18+n)(-16+n)(-14+n) \\
&\quad (-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma) \\
&\quad (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\
&\quad (n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))), \\
F_{2,n,\gamma}(19,0) &\cong -((4294967296(-17+n)(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-81+\gamma^2)(-64+\gamma^2)(-49+\gamma^2)(-36+\gamma^2) \\
&\quad (-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/(230945(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n) \\
&\quad (n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
&\quad (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))), \\
F_{2,n,\gamma}(19,2) &\cong -((4294967296(68918850-40015935n-4094712n^2+8573564n^3-2847012n^4+474054n^5-45528n^6+2556n^7-78n^8+n^9)(400 \\
&\quad -420n+21n^2-4\gamma^2)(-131681894400+202759531776\gamma^2-84865562640\gamma^4+15088541896\gamma^6-1367593305\gamma^8+68943381\gamma^{10} \\
&\quad -1999370\gamma^{12}+32946\gamma^{14}-285\gamma^{16}+\gamma^{18}))/((4849845(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n) \\
&\quad (-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma) \\
&\quad (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma)) \\
&\quad (n-2(10+\gamma))), \\
F_{2,n,\gamma}(21,0) &\cong (68719476736(-19+n)(-17+n)(-15+n)(-13+n)(-11+n)(-9+n)(-7+n)(-5+n)(-3+n)(-100+\gamma^2)(-81+\gamma^2)(-64+\gamma^2) \\
&\quad (-49+\gamma^2)(-36+\gamma^2)(-25+\gamma^2)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/(969969(-20+n)(-18+n)(-16+n)(-14+n)(-12+n) \\
&\quad (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma) \\
&\quad (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\
&\quad (n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma)))
\end{aligned}$$

for $n > 2\gamma + 20$.

Lemma 1.3. *It is true that*

$$F_{3,n,\gamma}(3,0) \cong 2/3(-2+\gamma)(-1+\gamma),$$

$$\begin{aligned}
F_{3,n,\gamma}(3,8) &\cong (2(48+44n+12n^2+n^3)(2-3\gamma+\gamma^2)(-55440n^8+1155n^9-1848n^7(-621-4\gamma+2\gamma^2)+7392n^6(-1811-39\gamma+17\gamma^2) \\
&\quad +528n^5(182607+8936\gamma-3346\gamma^2-72\gamma^3+18\gamma^4)-4224n^4(104393+9936\gamma-3080\gamma^2-243\gamma^3+45\gamma^4)+16896n^2(-126620 \\
&\quad -39651\gamma+5686\gamma^2+3522\gamma^3-115\gamma^4-75\gamma^5+5\gamma^6)-1408n^3(-897756-155532\gamma+36739\gamma^2+7872\gamma^3-923\gamma^4-60\gamma^5+10\gamma^6)
\end{aligned}$$

$$+ 71680(-7200 - 10800\gamma - 2062\gamma^2 + 2307\gamma^3 + 669\gamma^4 - 150\gamma^5 - 48\gamma^6 + 3\gamma^7 + \gamma^8) + 1280n(1438560 + 869256\gamma - 12520\gamma^2 - 123848\gamma^3 - 10497\gamma^4 + 5176\gamma^5 + 258\gamma^6 - 56\gamma^7 + 7\gamma^8)) / (3465(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))),$$

$$F_{3,n,\gamma}(3, 10) \cong -((2(384 + 400n + 140n^2 + 20n^3 + n^4)(2 - 3\gamma + \gamma^2)(210210n^{10} - 3003n^{11} + 12012n^9(-543 - 2\gamma + \gamma^2) - 24024n^8(-4916 - 59\gamma + 27\gamma^2) - 6864n^7(201345 + 5312\gamma - 2212\gamma^2 - 24\gamma^3 + 6\gamma^4) + 13728n^6(796109 + 39062\gamma - 14616\gamma^2 - 540\gamma^3 + 114\gamma^4) + 9152n^5(-6475641 - 542454\gamma + 178153\gamma^2 + 15504\gamma^3 - 2642\gamma^4 - 60\gamma^5 + 10\gamma^6) - 18304n^4(-11944782 - 1637763\gamma + 451781\gamma^2 + 81678\gamma^3 - 10144\gamma^4 - 930\gamma^5 + 110\gamma^6) - 3328n^3(159591420 + 35447328\gamma - 7500250\gamma^2 - 2811364\gamma^3 + 191275\gamma^4 + 64160\gamma^5 - 4100\gamma^6 - 280\gamma^7 + 35\gamma^8) + 6656n^2(118911240 + 43802892\gamma - 5591484\gamma^2 - 5219782\gamma^3 - 28161\gamma^4 + 201170\gamma^5 + 1560\gamma^6 - 2380\gamma^7 + 105\gamma^8) + 645120(259200 + 388800\gamma + 67032\gamma^2 - 93852\gamma^3 - 26146\gamma^4 + 7707\gamma^5 + 2397\gamma^6 - 258\gamma^7 - 84\gamma^8 + 3\gamma^9 + \gamma^{10}) + 3072n(-202068000 - 133620480\gamma + 1295196\gamma^2 + 23033360\gamma^3 + 2524095\gamma^4 - 1356670\gamma^5 - 152697\gamma^6 + 30800\gamma^7 + 1785\gamma^8 - 210\gamma^9 + 21\gamma^{10}))/((9009(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma)))),$$

$$F_{3,n,\gamma}(3, 12) \cong (2(3840 + 4384n + 1800n^2 + 340n^3 + 30n^4 + n^5)(2 - 3\gamma + \gamma^2)(-1441440n^{12} + 15015n^{13} - 12012n^{11}(-5203 - 12\gamma + 6\gamma^2) + 144144n^{10}(-11222 - 83\gamma + 39\gamma^2) + 102960n^9(270237 + 4308\gamma - 1897\gamma^2 - 12\gamma^3 + 3\gamma^4) - 411840n^8(813458 + 23523\gamma - 9653\gamma^2 - 201\gamma^3 + 45\gamma^4) - 9152n^7(-316423029 - 15120756\gamma + 5727388\gamma^2 + 266640\gamma^3 - 52430\gamma^4 - 600\gamma^5 + 100\gamma^6) + 109824n^6(-165015666 - 12349629\gamma + 4249817\gamma^2 + 377940\gamma^3 - 63040\gamma^4 - 2550\gamma^5 + 350\gamma^6) + 16640n^5(4907790654 + 558768420\gamma - 170116603\gamma^2 - 26960292\gamma^3 + 3575978\gamma^4 + 368040\gamma^5 - 38590\gamma^6 - 840\gamma^7 + 105\gamma^8) - 199680n^4(1300680078 + 223082301\gamma - 57315791\gamma^2 - 15993497\gamma^3 + 1467145\gamma^4 + 371650\gamma^5 - 24710\gamma^6 - 2450\gamma^7 + 210\gamma^8) + 12288n^3(-61741057896 - 25371509004\gamma + 3002092272\gamma^2 + 3620658230\gamma^3 + 99025120\gamma^4 - 188309425\gamma^5 - 8771315\gamma^6 + 4052300\gamma^7 + 96250\gamma^8 - 29925\gamma^9 + 945\gamma^{10}) - 1024n^2(-546767904744 - 142610147856\gamma + 28128028988\gamma^2 + 14615204280\gamma^3 - 590860285\gamma^4 - 524463300\gamma^5 + 9591620\gamma^6 + 6812400\gamma^7 - 269325\gamma^8 - 18900\gamma^9 + 1890\gamma^{10}) + 11354112(-12700800 - 19051200\gamma - 3025368\gamma^2 + 4987548\gamma^3 + 1348186\gamma^4 - 471495\gamma^5 - 143599\gamma^6 + 20349\gamma^7 + 6513\gamma^8 - 405\gamma^9 - 133\gamma^{10} + 3\gamma^{11} + \gamma^{12}) + 86016n(6439970880 + 4532742720\gamma - 35219928\gamma^2 - 883827312\gamma^3 - 108482554\gamma^4 + 63529380\gamma^5 + 8998951\gamma^6 - 2042556\gamma^7 - 246357\gamma^8 + 28620\gamma^9 + 1717\gamma^{10} - 132\gamma^{11} + 11\gamma^{12}))/((45045(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))),$$

$$F_{3,n,\gamma}(3, 14) \cong -((2(46080 + 56448n + 25984n^2 + 5880n^3 + 700n^4 + 42n^5 + n^6)(2 - 3\gamma + \gamma^2)(4594590n^{14} - 36465n^{15} + 204204n^{13}(-1298 - 2\gamma + \gamma^2) - 408408n^{12}(-22709 - 111\gamma + 53\gamma^2) - 116688n^{11}(1883636 + 19588\gamma - 8918\gamma^2 - 36\gamma^3 + 9\gamma^4) + 233376n^{10}(15985129 + 296781\gamma - 128464\gamma^2 - 1674\gamma^3 + 387\gamma^4) + 155584n^9(-300471474 - 9038556\gamma + 3702178\gamma^2 + 105000\gamma^3 - 22220\gamma^4 - 150\gamma^5 + 25\gamma^6) - 933504n^8(-470637849 - 21623751\gamma + 8319893\gamma^2 + 434055\gamma^3 - 82735\gamma^4 - 1875\gamma^5 + 275\gamma^6) - 56576n^7(55014088839 + 3722010972\gamma - 1330200702\gamma^2 - 117009824\gamma^3 + 19578616\gamma^4 + 1027000\gamma^5 - 128300\gamma^6 - 1400\gamma^7 + 175\gamma^8) + 113152n^6(146323444416 + 14272617159\gamma - 4656062846\gamma^2 - 660774936\gamma^3 + 92966898\gamma^4 + 9890250\gamma^5 - 991800\gamma^6 - 39900\gamma^7 + 4025\gamma^8) - 452608n^4(-410274169104 - 82067651676\gamma + 20073932258\gamma^2 + 7384198935\gamma^3 - 523306920\gamma^4 - 247744950\gamma^5 + 8855010\gamma^6 + 3350550\gamma^7 - 134225\gamma^8 - 14175\gamma^9 + 945\gamma^{10}) + 17408n^5(-3748237676844 - 522606195966\gamma + 151290534483\gamma^2 + 34204431320\gamma^3 - 3736827550\gamma^4 - 790977400\gamma^5 + 56364860\gamma^6 + 6372800\gamma^7 - 467950\gamma^8 - 9450\gamma^9 + 945\gamma^{10}) - 69632n^3(5244358127904 + 1533046141512\gamma - 287571898960\gamma^2 - 186006655796\gamma^3 + 4147609197\gamma^4 + 8669263180\gamma^5 + 83245806\gamma^6 - 178258976\gamma^7 - 508172\gamma^8 + 1470420\gamma^9 - 38598\gamma^{10} - 2772\gamma^{11} + 231\gamma^{12}) + 139264n^2(3296990543616 + 1467185901984\gamma - 164358881240\gamma^2 - 236847511632\gamma^3 - 9894788724\gamma^4 + 14843958765\gamma^5 + 1047140958\gamma^6 - 434487648\gamma^7 - 26966191\gamma^8 + 5871285\gamma^9 + 180936\gamma^{10} - 29106\gamma^{11} + 693\gamma^{12}) + 98402304(812851200 + 1219276800\gamma + 180922752\gamma^2 - 338254272\gamma^3 - 89309272\gamma^4 + 35163228\gamma^5 + 10538522\gamma^6 - 1773831\gamma^7 - 560431\gamma^8 + 46269\gamma^9 + 15025\gamma^{10} - 597\gamma^{11} - 197\gamma^{12} + 3\gamma^{13} + \gamma^{14}) + 49152n(-6439206251520 - 4746826385280\gamma + 32801269952\gamma^2 + 1009461397896\gamma^3 + 132052491844\gamma^4 - 82756229122\gamma^5 - 13099181081\gamma^6 + 3275435968\gamma^7 + 497535452\gamma^8 - 65288076\gamma^9 - 7945294\gamma^{10} + 610456\gamma^{11} + 36344\gamma^{12} - 2002\gamma^{13} + 143\gamma^{14}))/((109395(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))),$$

$$F_{3,n,\gamma}(3, 16) \cong (2(645120 + 836352n + 420224n^2 + 108304n^3 + 15680n^4 + 1288n^5 + 56n^6 + n^7)(2 - 3\gamma + \gamma^2)(-110853600n^{16} + 692835n^{17} - 2217072n^{15}(-3701 - 4\gamma + 2\gamma^2) + 8868288n^{14}(-42037 - 143\gamma + 69\gamma^2) + 4434144n^{13}(2622883 + 18808\gamma - 8750\gamma^2 - 24\gamma^3 + 6\gamma^4) - 35473152n^{12}(7443837 + 94258\gamma - 42210\gamma^2 - 369\gamma^3 + 87\gamma^4) - 11824384n^{11}(-381528615 - 7724736\gamma + 3321013\gamma^2 + 62160\gamma^3 - 13739\gamma^4 - 60\gamma^5 + 10\gamma^6) + 47297536n^{10}(-1250382153 - 38049192\gamma + 15643021\gamma^2 + 527190\gamma^3 - 108275\gamma^4 - 1545\gamma^5 + 235\gamma^6) + 1074944n^9(559131169389 + 24558425184\gamma - 9600385620\gamma^2 - 530189632\gamma^3 + 99882578\gamma^4 + 3162800\gamma^5 - 431500\gamma^6 - 2800\gamma^7 + 350\gamma^8) - 17199104n^8(276233693493 + 17056618242\gamma - 6287856530\gamma^2 - 538624466\gamma^3 + 91296388\gamma^4 + 5479900\gamma^5 - 652550\gamma^6 - 14525\gamma^7 + 1575\gamma^8) - 1323008n^7(-22012372032108 - 1880443005036\gamma + 645817645263\gamma^2 + 83236850680\gamma^3 - 12318311426\gamma^4$$

$$\begin{aligned}
& -1306723040\gamma^5 + 129840130\gamma^6 + 6966400\gamma^7 - 626675\gamma^8 - 6300\gamma^9 + 630\gamma^{10} + 5292032n^6(-25910723228148 - 3039912558957\gamma \\
& + 954892914626\gamma^2 + 183093227930\gamma^3 - 22502573500\gamma^4 - 4161120880\gamma^5 + 317735390\gamma^6 + 37421300\gamma^7 - 2565675\gamma^8 - 99225\gamma^9 \\
& + 7875\gamma^{10}) + 2646016n^5(184175828021592 + 29705886219672\gamma - 8288466760976\gamma^2 - 2383864049000\gamma^3 + 221431610951\gamma^4 \\
& + 75075618160\gamma^5 - 3661961908\gamma^6 - 1030746752\gamma^7 + 44246881\gamma^8 + 5410440\gamma^9 - 299586\gamma^{10} - 5544\gamma^{11} + 462\gamma^{12}) \\
& - 21168128n^4(60027424541568 + 13450335338772\gamma - 3170214622926\gamma^2 - 1417005923525\gamma^3 + 79344597720\gamma^4 + 59919192010\gamma^5 \\
& - 881575158\gamma^6 - 1177720292\gamma^7 + 13038921\gamma^8 + 10283490\gamma^9 - 263886\gamma^{10} - 29799\gamma^{11} + 1617\gamma^{12}) - 3735552n^3(-621372384317952 \\
& - 197952547345200\gamma + 35720196941928\gamma^2 + 27099453429048\gamma^3 - 250846646228\gamma^4 - 1502302138604\gamma^5 - 43310842815\gamma^6 \\
& + 40401906104\gamma^7 + 1221251705\gamma^8 - 531230112\gamma^9 - 7035679\gamma^{10} + 2980208\gamma^{11} - 54285\gamma^{12} - 4004\gamma^{13} + 286\gamma^{14}) \\
& + 14942208n^2(-183745858233600 - 86927894897760\gamma + 9332563080744\gamma^2 + 15357323587776\gamma^3 + 799962480120\gamma^4 \\
& - 1094734033273\gamma^5 - 95152684134\gamma^6 + 38900598058\gamma^7 + 3376187265\gamma^8 - 720364344\gamma^9 - 49076139\gamma^{10} + 6572566\gamma^{11} \\
& + 222915\gamma^{12} - 23023\gamma^{13} + 429\gamma^{14}) + 6747586560(-65840947200 - 98761420800\gamma - 13841891712\gamma^2 + 28617872832\gamma^3 \\
& + 7414973784\gamma^4 - 3186475740\gamma^5 - 942929554\gamma^6 + 178843539\gamma^7 + 55933433\gamma^8 - 5521620\gamma^9 - 1777456\gamma^{10} + 94626\gamma^{11} + 30982\gamma^{12} \\
& - 840\gamma^{13} - 278\gamma^{14} + 3\gamma^{15} + \gamma^{16}) + 589824n(3059042518425600 + 2337656949734400\gamma - 15165909220608\gamma^2 - 530312566017600\gamma^3 \\
& - 72267391234800\gamma^4 + 47750314576720\gamma^5 + 8071260130304\gamma^6 - 2173279426640\gamma^7 - 370721439685\gamma^8 + 53728068160\gamma^9 \\
& + 8285665316\gamma^{10} - 717344320\gamma^{11} - 85992830\gamma^{12} + 4724720\gamma^{13} + 273988\gamma^{14} - 11440\gamma^{15} + 715\gamma^{16}))/ (2078505(-18 + n)(-16 + n) \\
& (-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma)) \\
& (n - 2(8 + \gamma))(n - 2(9 + \gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(3, 18) \cong & -((2(10321920 + 14026752n + 7559936n^2 + 2153088n^3 + 359184n^4 + 36288n^5 + 2184n^6 + 72n^7 + n^8)(2 - 3\gamma + \gamma^2)(320089770n^{18} \\
& - 1616615n^{19} + 3879876n^{17}(-7619 - 6\gamma + 3\gamma^2) - 23279256n^{16}(-72646 - 179\gamma + 87\gamma^2) - 4434144n^{15}(15139577 + 78096\gamma \\
& - 36876\gamma^2 - 72\gamma^3 + 18\gamma^4) + 26604864n^{14}(73769779 + 666598\gamma - 305480\gamma^2 - 1884\gamma^3 + 450\gamma^4) + 41385344n^{13}(-1057770049 \\
& - 15139314\gamma + 6722635\gamma^2 + 87792\gamma^3 - 19958\gamma^4 - 60\gamma^5 + 10\gamma^6) - 744936192n^{12}(-1022030684 - 21739405\gamma + 9332447\gamma^2 \\
& + 216438\gamma^3 - 46580\gamma^4 - 450\gamma^5 + 70\gamma^6) - 7524608n^{11}(1390405602723 + 42116824224\gamma - 17422501244\gamma^2 - 650733768\gamma^3 \\
& + 131596342\gamma^4 + 2755680\gamma^5 - 395960\gamma^6 - 1680\gamma^7 + 210\gamma^8) + 45147648n^{10}(2534054048391 + 106156776012\gamma - 42126089200\gamma^2 \\
& - 2386666916\gamma^3 + 448844450\gamma^4 + 17227300\gamma^5 - 2252560\gamma^6 - 31640\gamma^7 + 3570\gamma^8) + 992256n^9(-1005472027736431 \\
& - 57109638049710\gamma + 21603930198291\gamma^2 + 1788110904864\gamma^3 - 308133797266\gamma^4 - 19883800020\gamma^5 + 2314097450\gamma^6 + 73735200\gamma^7 \\
& - 7332850\gamma^8 - 44100\gamma^9 + 4410\gamma^{10}) - 25798656n^8(-268302488998326 - 20404928298813\gamma + 7293424846981\gamma^2 + 862498837908\gamma^3 \\
& - 133257789240\gamma^4 - 13849438050\gamma^5 + 1386231210\gamma^6 + 86832900\gamma^7 - 7325500\gamma^8 - 154350\gamma^9 + 13230\gamma^{10}) \\
& - 18522112n^7(2048228534248724 + 207270954346392\gamma - 69113345631538\gamma^2 - 11564782577628\gamma^3 + 1548877048403\gamma^4 \\
& + 256485282720\gamma^5 - 20844417508\gamma^6 - 2458034712\gamma^7 + 164593401\gamma^8 + 8724240\gamma^9 - 606396\gamma^{10} - 5544\gamma^{11} + 462\gamma^{12}) \\
& + 111132672n^6(1459653436551648 + 196489606846116\gamma - 59966792913164\gamma^2 - 14237273807754\gamma^3 + 1561886796543\gamma^4 \\
& + 422369980140\gamma^5 - 24946836432\gamma^6 - 5798962428\gamma^7 + 269117219\gamma^8 + 34459110\gamma^9 - 1739304\gamma^{10} - 63756\gamma^{11} + 4158\gamma^{12}) \\
& + 4358144n^5(-121739525425376856 - 21935929342627872\gamma + 5946404669194060\gamma^2 + 2040103185897240\gamma^3 \\
& - 164348378134781\gamma^4 - 79048946690706\gamma^5 + 2551653670927\gamma^6 + 1486500030624\gamma^7 - 31967202249\gamma^8 - 13378320018\gamma^9 \\
& + 366414783\gamma^{10} + 48687408\gamma^{11} - 2133978\gamma^{12} - 36036\gamma^{13} + 2574\gamma^{14}) - 26148864n^4(-49253907585508560 \\
& - 12050595741255192\gamma + 2757105862109904\gamma^2 + 1426899212483548\gamma^3 - 63738866796910\gamma^4 - 70901627134697\gamma^5 \\
& - 60245465809\gamma^6 + 1766813742652\gamma^7 + 16895460140\gamma^8 - 22569347871\gamma^9 - 37118823\gamma^{10} + 135766554\gamma^{11} - 2305380\gamma^{12} \\
& - 282282\gamma^{13} + 12870\gamma^{14}) + 1179648n^2(2108439450893376000 + 1047396750837868800\gamma - 108595921310089920\gamma^2 \\
& - 198286530327209568\gamma^3 - 11878722180164352\gamma^4 + 15540038022631976\gamma^5 + 1536883002893560\gamma^6 - 632122886935484\gamma^7 \\
& - 65840219118751\gamma^8 + 14309687543508\gamma^9 + 1331478709680\gamma^{10} - 180106274348\gamma^{11} - 12612588142\gamma^{12} + 1167282116\gamma^{13} \\
& + 40920880\gamma^{14} - 3003000\gamma^{15} + 45045\gamma^{16}) - 196608n^3(11257435813158086400 + 3837550066418136960\gamma \\
& - 670918785573971424\gamma^2 - 575479841067439488\gamma^3 - 407344244065784\gamma^4 + 36137544713525808\gamma^5 + 1556202356412116\gamma^6 \\
& - 1163051210928264\gamma^7 - 57839469662667\gamma^8 + 20137651327584\gamma^9 + 801557252300\gamma^{10} - 181233398808\gamma^{11} - 3389256794\gamma^{12} \\
& + 725813088\gamma^{13} - 9441432\gamma^{14} - 720720\gamma^{15} + 45045\gamma^{16}) + 57354485760(6584094720000 + 9876142080000\gamma + 1318348224000\gamma^2 \\
& - 2960548704000\gamma^3 - 755339270112\gamma^4 + 347265446832\gamma^5 + 101707929184\gamma^6 - 21070829640\gamma^7 - 6536272854\gamma^8 + 731005539\gamma^9 \\
& + 233679033\gamma^{10} - 14984220\gamma^{11} - 4875656\gamma^{12} + 178626\gamma^{13} + 58782\gamma^{14} - 1140\gamma^{15} - 378\gamma^{16} + 3\gamma^{17} + \gamma^{18}) \\
& + 1310720n(-119743508037888000 - 941948593425100800\gamma + 5886112755283200\gamma^2 + 224669843343893376\gamma^3 \\
& + 31505131136988432\gamma^4 - 21707143810102080\gamma^5 - 3832453926361016\gamma^6 + 1092843101495376\gamma^7 + 199985560572765\gamma^8 \\
& - 31293161412678\gamma^9 - 5453222573757\gamma^{10} + 521456078880\gamma^{11} + 79826216074\gamma^{12} - 4919598684\gamma^{13} - 574517658\gamma^{14} \\
& + 23763168\gamma^{15} + 1330329\gamma^{16} - 43758\gamma^{17} + 2431\gamma^{18}))/ (4849845(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n) \\
& (-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)
\end{aligned}$$

$$(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),$$

$$F_{3,n,\gamma}(5, 6) \cong -((32(-24-10n+3n^2+n^3)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4)(-8316n^6+231n^7-132n^5(-934-6\gamma+3\gamma^2)+792n^4(-1222-29\gamma+11\gamma^2)+528n^3(8119+490\gamma-136\gamma^2-4\gamma^3+\gamma^4)-1056n^2(9900+1339\gamma-241\gamma^2-34\gamma^3+4\gamma^4)-320n(-38520-11706\gamma+847\gamma^2+642\gamma^3-2\gamma^4-6\gamma^5+\gamma^6)-1920(2400+2000\gamma+154\gamma^2-205\gamma^3-35\gamma^4+5\gamma^5+\gamma^6)))/(3465(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),$$

$$F_{3,n,\gamma}(5, 8) \cong -((32(-144-84n+8n^2+9n^3+n^4)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4)(-168168n^8+3003n^9-3432n^7(-1185-4\gamma+2\gamma^2)+13728n^6(-4045-47\gamma+20\gamma^2)+6864n^5(68355+1852\gamma-666\gamma^2-8\gamma^3+2\gamma^4)-54912n^4(45958+2477\gamma-737\gamma^2-33\gamma^3+6\gamma^4)-1664n^3(-5127234-512598\gamma+120307\gamma^2+14340\gamma^3-1703\gamma^4-60\gamma^5+10\gamma^6)+6656n^2(-2568240-470532\gamma+77660\gamma^2+23532\gamma^3-1195\gamma^4-285\gamma^5+20\gamma^6)+71680(-86400-72000\gamma-3144\gamma^2+9380\gamma^3+1414\gamma^4-385\gamma^5-71\gamma^6+5\gamma^7+\gamma^8)+1280n(13734720+4864272\gamma-384188\gamma^2-400988\gamma^3-12397\gamma^4+9772\gamma^5+218\gamma^6-56\gamma^7+7\gamma^8)))/(45045(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),$$

$$F_{3,n,\gamma}(5, 10) \cong (32(-1152-816n-20n^2+80n^3+17n^4+n^5)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4)(240240n^{10}-3003n^{11}+8580n^9(-995-2\gamma+\gamma^2)-17160n^8(-10342-69\gamma+31\gamma^2)-2288n^7(1044963+15580\gamma-6280\gamma^2-40\gamma^3+10\gamma^4)+45760n^6(477126+13423\gamma-4825\gamma^2-106\gamma^3+22\gamma^4)+4160n^5(-32974449-1603666\gamma+507485\gamma^2+26308\gamma^3-4398\gamma^4-60\gamma^5+10\gamma^6)-8320n^4(-70720566-5688085\gamma+1545995\gamma^2+163738\gamma^3-20610\gamma^4-1110\gamma^5+130\gamma^6)+5120n^2(569943780+124491974\gamma-20405752\gamma^2-8734769\gamma^3+241057\gamma^4+204255\gamma^5-2305\gamma^6-1470\gamma^7+70\gamma^8)-256n^3(6517745508+855736040\gamma-190372430\gamma^2-39480100\gamma^3+3186555\gamma^4+540700\gamma^5-36800\gamma^6-1400\gamma^7+175\gamma^8)+215040(4233600+3528000\gamma+67656\gamma^2-531620\gamma^3-72430\gamma^4+28245\gamma^5+4893\gamma^6-630\gamma^7-120\gamma^8+5\gamma^9+\gamma^{10}))+7168n(-378957600-147376800\gamma+13031108\gamma^2+15264520\gamma^3+610445\gamma^4-555470\gamma^5-33811\gamma^6+7780\gamma^7+255\gamma^8-30\gamma^9+3\gamma^{10}))/((45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),$$

$$F_{3,n,\gamma}(5, 12) \cong -((32(-11520-9312n-1016n^2+780n^3+250n^4+27n^5+n^6)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4)(-5513508n^{12}+51051n^{13}-29172n^{11}(-9239-12\gamma+6\gamma^2)+350064n^{10}(-22521-95\gamma+44\gamma^2)+116688n^9(1316961+12110\gamma-5195\gamma^2-20\gamma^3+5\gamma^4)-466752n^8(4505727+75910\gamma-30100\gamma^2-385\gamma^3+85\gamma^4)-14144n^7(-1465530141-41156568\gamma+15014164\gamma^2+431160\gamma^3-83030\gamma^4-600\gamma^5+100\gamma^6)+169728n^6(-874476639-38742855\gamma+12892176\gamma^2+705160\gamma^3-115750\gamma^4-2950\gamma^5+400\gamma^6)+4352n^5(176496907668+11965818510\gamma-3578789815\gamma^2-343976520\gamma^3+46175270\gamma^4+2916900\gamma^5-304750\gamma^6-4200\gamma^7+525\gamma^8)-52224n^4(53935911972+5531336520\gamma-1449390300\gamma^2-236989745\gamma^3+24011810\gamma^4+3428700\gamma^5-243300\gamma^6-14350\gamma^7+1225\gamma^8)+208896n^2(-53187726144-13056416080\gamma+2172463060\gamma^2+1129868980\gamma^3-19335055\gamma^4-36981785\gamma^5-520408\gamma^6+510440\gamma^7+3115\gamma^8-2415\gamma^9+84\gamma^{10})-17408n^3(-404072472096-63126604968\gamma+13831151080\gamma^2+3886887660\gamma^3-246101435\gamma^4-87164040\gamma^5+2845588\gamma^6+721560\gamma^7-31815\gamma^8-1260\gamma^9+126\gamma^{10}))+11354112(-270950400-225792000\gamma-96384\gamma^2+37551680\gamma^3+4703176\gamma^4-2339300\gamma^5-385582\gamma^6+68565\gamma^7+12573\gamma^8-950\gamma^9-184\gamma^{10}+5\gamma^{11}+\gamma^{12}))+86016n(111307069440+46153641600\gamma-4491383104\gamma^2-5547061752\gamma^3-235353244\gamma^4+254438070\gamma^5+19136743\gamma^6-5313816\gamma^7-387167\gamma^8+48030\gamma^9+1801\gamma^{10}-132\gamma^{11}+11\gamma^{12}))/((765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))),$$

$$F_{3,n,\gamma}(5, 14) \cong (32(-138240-123264n-21504n^2+8344n^3+3780n^4+574n^5+39n^6+n^7)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4)(19399380n^{14}-138567n^{15}+554268n^{13}(-2248-2\gamma+\gamma^2)-1108536n^{12}(-43886-125\gamma+59\gamma^2)-2217072n^{11}(581698+3554\gamma-1584\gamma^2-4\gamma^3+\gamma^4)+4434144n^{10}(5536662+60835\gamma-25585\gamma^2-210\gamma^3+48\gamma^4)+268736n^9(-1287711012-23070108\gamma+9137524\gamma^2+163890\gamma^3-34040\gamma^4-150\gamma^5+25\gamma^6)-537472n^8(-6827695554-187840215\gamma+69811951\gamma^2+2304075\gamma^3-430355\gamma^4-6375\gamma^5+925\gamma^6)-82688n^7(355963437129+14483828778\gamma-5020572948\gamma^2-278095568\gamma^3+45935092\gamma^4+1562500\gamma^5-192800\gamma^6-1400\gamma^7+175\gamma^8)+2149888n^6(82754093508+4870721445\gamma-1559493835\gamma^2-137711420\gamma^3+19577152\gamma^4+1318750\gamma^5-132650\gamma^6-3500\gamma^7+350\gamma^8)+330752n^5(-2418166873812-203870691438\gamma+59366363427\gamma^2+8154234950\gamma^3-952540300\gamma^4-120620920\gamma^5+9127544\gamma^6+639380\gamma^7-47320\gamma^8-630\gamma^9+63\gamma^{10})-661504n^4(-3942076045104-477057316980\gamma+123160897546\gamma^2+26282862875\gamma^3-2310770485\gamma^4-564439450\gamma^5+26729810\gamma^6+5023550\gamma^7-226100\gamma^8-14175\gamma^9+945\gamma^{10})-77824n^3(75870772509600+13393272139752\gamma-2931134146840\gamma^2-999076518124\gamma^3+53687691859\gamma^4+29873276030\gamma^5-413537324\gamma^6-404753776\gamma^7+4378178\gamma^8+2229570\gamma^9-68208\gamma^{10}-2772\gamma^{11}+231\gamma^{12}))+155648n^2(55297200704256+14766685178400\gamma-2506680055896\gamma^2-1476754607800\gamma^3+17202386368\gamma^4+59692722875\gamma^5+1650578947\gamma^6-1155924700\gamma^7-37071398\gamma^8+10465875\gamma^9+156639\gamma^{10}-34650\gamma^{11}+924\gamma^{12}))+98402304(21946982400+18289152000\gamma-263143296\gamma^2-3267478080\gamma^3-381053640\gamma^4+227034980\gamma^5+35935318\gamma^6-7893065\gamma^7-1403995\gamma^8+145515\gamma^9+27477\gamma^{10}-1355\gamma^{11}-265\gamma^{12}+5\gamma^{13}+\gamma^{14}))+49152n(-141776957629440-61628399683200\gamma+6475316040000\gamma^2$$

$$+ 8231249947032\gamma^3 + 350588805308\gamma^4 - 440117685742\gamma^5 - 36022510167\gamma^6 + 11644639426\gamma^7 + 1046105824\gamma^8 - 156916956\gamma^9 \\ - 12239276\gamma^{10} + 981442\gamma^{11} + 38808\gamma^{12} - 2002\gamma^{13} + 143\gamma^{14})/(2078505(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n) \\ (-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\ (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))),$$

$$F_{3,n,\gamma}(5, 16) \cong -((32(-1935360 - 1863936n - 424320n^2 + 95312n^3 + 61264n^4 + 11816n^5 + 1120n^6 + 53n^7 + n^8)(-6+5\gamma+5\gamma^2-5\gamma^3+\gamma^4) \\ (-170714544n^{16} + 969969n^{17} - 2217072n^{15}(-6281-4\gamma+2\gamma^2) + 8868288n^{14}(-78777-159\gamma+76\gamma^2) + 10346336n^{13}(2331165 \\ + 9980\gamma - 4562\gamma^2 - 8\gamma^3 + 2\gamma^4) - 82770688n^{12}(7338699 + 55787\gamma - 24383\gamma^2 - 137\gamma^3 + 32\gamma^4) - 7524608n^{11}(-1533760857 \\ - 18732778\gamma + 7821869\gamma^2 + 94420\gamma^3 - 20535\gamma^4 - 60\gamma^5 + 10\gamma^6) + 30098432n^{10}(-5605403889 - 103320143\gamma + 41142772\gamma^2 \\ + 895340\gamma^3 - 180315\gamma^4 - 1725\gamma^5 + 260\gamma^6) + 82688n^9(23192591294211 + 619129845480\gamma - 234441167572\gamma^2 - 8347603768\gamma^3 \\ + 1543845142\gamma^4 + 32685800\gamma^5 - 4400900\gamma^6 - 19600\gamma^7 + 2450\gamma^8) - 1323008n^8(12856458241008 + 483749535921\gamma \\ - 173407211359\gamma^2 - 9527772681\gamma^3 + 1598213631\gamma^4 + 63522375\gamma^5 - 7492275\gamma^6 - 113925\gamma^7 + 12250\gamma^8) \\ - 9261056n^7(-12675622540902 - 661033069738\gamma + 222802866741\gamma^2 + 18230562280\gamma^3 - 2722001650\gamma^4 - 187256820\gamma^5 \\ + 18749886\gamma^6 + 674520\gamma^7 - 60305\gamma^8 - 420\gamma^9 + 42\gamma^{10}) + 37044224n^6(-16861078913724 - 1208645766668\gamma + 379146845190\gamma^2 \\ + 45328651550\gamma^3 - 5849563610\gamma^4 - 673134870\gamma^5 + 54242784\gamma^6 + 4084080\gamma^7 - 285145\gamma^8 - 7455\gamma^9 + 588\gamma^{10}) \\ + 1089536n^5(2311701978530568 + 227747746770080\gamma - 65455739148948\gamma^2 - 11382033890252\gamma^3 + 1208449640919\gamma^4 \\ + 234022356360\gamma^5 - 13697116748\gamma^6 - 2164846152\gamma^7 + 103643981\gamma^8 + 7814940\gamma^9 - 439866\gamma^{10} - 5544\gamma^{11} + 462\gamma^{12}) \\ - 8716288n^4(858675295026960 + 117312382114352\gamma - 30123492888024\gamma^2 - 7707160581104\gamma^3 + 613548928530\gamma^4 \\ + 212772094680\gamma^5 - 7002791258\gamma^6 - 2815728006\gamma^7 + 63050519\gamma^8 + 16892295\gamma^9 - 513891\gamma^{10} - 33957\gamma^{11} + 1848\gamma^{12}) \\ + 786432n^3(-27189462120768000 - 7742037004814400\gamma + 1340436302902960\gamma^2 + 861310915640224\gamma^3 - 7344633634436\gamma^4 \\ - 40317745404244\gamma^5 - 1447708396946\gamma^6 + 968034391982\gamma^7 + 45591651217\gamma^8 - 12338809217\gamma^9 - 505010268\gamma^{10} + 78152844\gamma^{11} \\ + 1547469\gamma^{12} - 189189\gamma^{13} + 4004\gamma^{14}) - 65536n^2(-239016334357742400 - 46232897556838560\gamma + 10159978148900024\gamma^2 \\ + 3959949358891120\gamma^3 - 189378257759866\gamma^4 - 143542880759894\gamma^5 + 317223435473\gamma^6 + 2600434070920\gamma^7 + 21710541027\gamma^8 \\ - 23486626002\gamma^9 - 18870243\gamma^{10} + 91360500\gamma^{11} - 2026101\gamma^{12} - 84084\gamma^{13} + 6006\gamma^{14}) + 2249195520(-2194698240000 \\ - 1828915200000\gamma + 48261312000\gamma^2 + 345036960000\gamma^3 + 37842220704\gamma^4 - 25970976080\gamma^5 - 3974585440\gamma^6 + 1016341480\gamma^7 \\ + 176334818\gamma^8 - 22444565\gamma^9 - 4151695\gamma^{10} + 281015\gamma^{11} + 53977\gamma^{12} - 1855\gamma^{13} - 365\gamma^{14} + 5\gamma^{15} + \gamma^{16}) \\ + 983040n(16721667164160000 + 7538680567756800\gamma - 842133337056000\gamma^2 - 1089790554247296\gamma^3 - 45668854061072\gamma^4 \\ + 65038327682944\gamma^5 + 5546674198296\gamma^6 - 2017304588376\gamma^7 - 199120625033\gamma^8 + 34606392392\gamma^9 + 3340560588\gamma^{10} \\ - 322731640\gamma^{11} - 25802238\gamma^{12} + 1465464\gamma^{13} + 58916\gamma^{14} - 2288\gamma^{15} + 143\gamma^{16}))/((14549535(-20+n)(-18+n)(-16+n)(-14+n) \\ (-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\ (-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\ (n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),$$

$$F_{3,n,\gamma}(7, 4) \cong (256(30 - n - 6n^2 + n^3)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6)(-2376n^4 + 99n^5 - 44n^3(-471 - 4\gamma + 2\gamma^2) + 176n^2(-453 \\ - 19\gamma + 5\gamma^2) + 48n(2670 + 408\gamma - 35\gamma^2 - 4\gamma^3 + \gamma^4) + 192(-300 - 175\gamma - 13\gamma^2 + 7\gamma^3 + \gamma^4)))/(3465(-10+n)(-8+n)(-6+n) \\ (-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),$$

$$F_{3,n,\gamma}(7, 6) \cong (256(120 + 26n - 25n^2 - 2n^3 + n^4)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6)(-18018n^6 + 429n^7 - 572n^5(-540 - 2\gamma + \gamma^2) \\ + 1144n^4(-2427 - 35\gamma + 13\gamma^2) + 208n^3(66981 + 2588\gamma - 688\gamma^2 - 12\gamma^3 + 3\gamma^4) - 416n^2(91464 + 8309\gamma - 1438\gamma^2 - 126\gamma^3 + 15\gamma^4) \\ - 1920(10800 + 6300\gamma + 168\gamma^2 - 427\gamma^3 - 49\gamma^4 + 7\gamma^5 + \gamma^6) - 64n(-776700 - 164592\gamma + 13541\gamma^2 + 5652\gamma^3 - 76\gamma^4 - 30\gamma^5 + 5\gamma^6)) \\ /(15015(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\ (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),$$

$$F_{3,n,\gamma}(7, 8) \cong (256(720 + 276n - 124n^2 - 37n^3 + 4n^4 + n^5)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6)(-82368n^8 + 1287n^9 - 1144n^7(-1983 - 4\gamma \\ + 2\gamma^2) + 4576n^6(-7680 - 55\gamma + 23\gamma^2) + 208n^5(1613019 + 27760\gamma - 9650\gamma^2 - 72\gamma^3 + 18\gamma^4) - 1664n^4(1219524 + 42974\gamma - 12226\gamma^2 \\ - 351\gamma^3 + 63\gamma^4) - 128n^3(-59931780 - 4025132\gamma + 905875\gamma^2 + 70416\gamma^3 - 8295\gamma^4 - 180\gamma^5 + 30\gamma^6) + 512n^2(-33350100 - 4206317\gamma \\ + 692929\gamma^2 + 134388\gamma^3 - 7692\gamma^4 - 1035\gamma^5 + 75\gamma^6) + 1792n(10820880 + 2688384\gamma - 260208\gamma^2 - 145160\gamma^3 - 1271\gamma^4 + 2320\gamma^5 \\ + 22\gamma^6 - 8\gamma^7 + \gamma^8) + 14336(-529200 - 308700\gamma + 2568\gamma^2 + 27223\gamma^3 + 2569\gamma^4 - 770\gamma^5 - 98\gamma^6 + 7\gamma^7 + \gamma^8)))/(45045(-14+n) \\ (-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\ (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),$$

$$F_{3,n,\gamma}(7, 10) \cong -((256(5760 + 2928n - 716n^2 - 420n^3 - 5n^4 + 12n^5 + n^6)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6)(1969110n^{10} - 21879n^{11} \\ + 48620n^9(-1617 - 2\gamma + \gamma^2) - 97240n^8(-18858 - 79\gamma + 35\gamma^2) - 3536n^7(7827477 + 74720\gamma - 29320\gamma^2 - 120\gamma^3 + 30\gamma^4) \\ + 35360n^6(7994427 + 146714\gamma - 50812\gamma^2 - 732\gamma^3 + 150\gamma^4) + 5440n^5(-364358253 - 11767750\gamma + 3567443\gamma^2 + 123144\gamma^3 \\ - 20190\gamma^4 - 180\gamma^5 + 30\gamma^6) - 10880n^4(-869757900 - 47253233\gamma + 12334015\gamma^2 + 876450\gamma^3 - 109176\gamma^4 - 3870\gamma^5 + 450\gamma^6) \\ + 43520n^2(1321286400 + 200961948\gamma - 34125444\gamma^2 - 9315874\gamma^3 + 378281\gamma^4 + 146030\gamma^5 - 2980\gamma^6 - 700\gamma^7 + 35\gamma^8) \\ - 4352n^3(6839373132 + 616332540\gamma - 134145210\gamma^2 - 18530860\gamma^3 + 1564355\gamma^4 + 167600\gamma^5 - 11680\gamma^6 - 280\gamma^7 + 35\gamma^8)$$

$$\begin{aligned}
& + 645120(33868800 + 19756800\gamma - 693552\gamma^2 - 2050972\gamma^3 - 161848\gamma^4 + 76503\gamma^5 + 8841\gamma^6 - 1218\gamma^7 - 162\gamma^8 + 7\gamma^9 + \gamma^{10}) \\
& + 21504n(-2739542400 - 749683440\gamma + 84149668\gamma^2 + 52212300\gamma^3 + 579795\gamma^4 - 1296870\gamma^5 - 47631\gamma^6 + 12360\gamma^7 + 245\gamma^8 \\
& - 30\gamma^9 + 3\gamma^{10})/((765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma)) \\
& (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\
& (n-2(7+\gamma))(n-2(8+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(7, 12) \cong & (256(57600 + 35040n - 4232n^2 - 4916n^3 - 470n^4 + 115n^5 + 22n^6 + n^7)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6)(-16628040n^{12} \\
& + 138567n^{13} - 184756n^{11}(-4887 - 4\gamma + 2\gamma^2) + 739024n^{10}(-39687 - 107\gamma + 49\gamma^2) + 201552n^9(3149043 + 18760\gamma - 7875\gamma^2 - 20\gamma^3 \\
& + 5\gamma^4) - 4031040n^8(2391288 + 26441\gamma - 10169\gamma^2 - 87\gamma^3 + 19\gamma^4) - 20672n^7(-5097797823 - 95130756\gamma + 33440008\gamma^2 + 649680\gamma^3 \\
& - 122810\gamma^4 - 600\gamma^5 + 100\gamma^6) + 248064n^6(-3371303271 - 100434621\gamma + 32102257\gamma^2 + 1197680\gamma^3 - 192610\gamma^4 - 3350\gamma^5 + 450\gamma^6) \\
& + 82688n^5(57944258334 + 2671685440\gamma - 769179105\gamma^2 - 50600140\gamma^3 + 6714610\gamma^4 + 288800\gamma^5 - 29930\gamma^6 - 280\gamma^7 + 35\gamma^8) \\
& - 1653760n^4(11742561444 + 827924041\gamma - 211130231\gamma^2 - 23523889\gamma^3 + 2434613\gamma^4 + 230630\gamma^5 - 16738\gamma^6 - 658\gamma^7 + 56\gamma^8) \\
& - 19456n^3(-2748762588312 - 298262336424\gamma + 65370865268\gamma^2 + 12277423360\gamma^3 - 880667325\gamma^4 - 188013740\gamma^5 + 7394208\gamma^6 \\
& + 1071280\gamma^7 - 49805\gamma^8 - 1260\gamma^9 + 126\gamma^{10}) + 77824n^2(-1193769565632 - 205386716412\gamma + 36493016364\gamma^2 + 12006031130\gamma^3 \\
& - 424197655\gamma^4 - 270929245\gamma^5 + 401345\gamma^6 + 2602040\gamma^7 - 8785\gamma^8 - 8505\gamma^9 + 315\gamma^{10}) + 11354112(-2743372800 - 1600300800\gamma \\
& + 90046512\gamma^2 + 185885532\gamma^3 + 12416136\gamma^4 - 8247715\gamma^5 - 877969\gamma^6 + 175161\gamma^7 + 21963\gamma^8 - 1785\gamma^9 - 243\gamma^{10} + 7\gamma^{11} + \gamma^{12}) \\
& + 86016n(1021364225280 + 298570246560\gamma - 37643601816\gamma^2 - 24578637432\gamma^3 - 219244054\gamma^4 + 787333440\gamma^5 + 35107747\gamma^6 \\
& - 11602236\gamma^7 - 568377\gamma^8 + 73560\gamma^9 + 1849\gamma^{10} - 132\gamma^{11} + 11\gamma^{12}))/((4849845(-18+n)(-16+n)(-14+n)(-12+n)(-10+n) \\
& (-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma) \\
& (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(7, 14) \cong & -((256(691200 + 478080n - 15744n^2 - 63224n^3 - 10556n^4 + 910n^5 + 379n^6 + 34n^7 + n^8)(48 - 28\gamma - 56\gamma^2 + 35\gamma^3 + 7\gamma^4 - 7\gamma^5 + \gamma^6) \\
& (64017954n^{14} - 415701n^{15} + 1293292n^{13}(-3498 - 2\gamma + \gamma^2) - 2586584n^{12}(-75153 - 139\gamma + 65\gamma^2) - 470288n^{11}(12062166 + 48332\gamma \\
& - 21160\gamma^2 - 36\gamma^3 + 9\gamma^4) + 940576n^{10}(126416487 + 919615\gamma - 377066\gamma^2 - 2106\gamma^3 + 477\gamma^4) + 62016n^9(-29764694718 \\
& - 356243762\gamma + 136722866\gamma^2 + 1682940\gamma^3 - 343910\gamma^4 - 1050\gamma^5 + 175\gamma^6) - 868224n^8(-24833244339 - 460365337\gamma + 165080905\gamma^2 \\
& + 3764445\gamma^3 - 688915\gamma^4 - 7125\gamma^5 + 1025\gamma^6) - 578816n^7(329082590301 + 9097337168\gamma - 3037212220\gamma^2 - 116761384\gamma^3 \\
& + 18905156\gamma^4 + 450200\gamma^5 - 54880\gamma^6 - 280\gamma^7 + 35\gamma^8) + 1157632n^6(1095179962512 + 44141683165\gamma - 13637562464\gamma^2 \\
& - 836912444\gamma^3 + 117570838\gamma^4 + 5517550\gamma^5 - 551420\gamma^6 - 10220\gamma^7 + 1015\gamma^8) - 4630528n^4(-4855913713104 - 408427501712\gamma \\
& + 104172180364\gamma^2 + 15222155435\gamma^3 - 1425776770\gamma^4 - 226812490\gamma^5 + 11931662\gamma^6 + 1421630\gamma^7 - 67585\gamma^8 - 2835\gamma^9 + 189\gamma^{10}) \\
& + 136192n^5(-46057035359688 - 2679260302172\gamma + 758358710515\gamma^2 + 72140555720\gamma^3 - 8514200320\gamma^4 - 737278060\gamma^5 \\
& + 56884892\gamma^6 + 2739800\gamma^7 - 202930\gamma^8 - 1890\gamma^9 + 189\gamma^{10}) + 57344n^2(1557144241833600 + 292669538487120\gamma \\
& - 54349785952608\gamma^2 - 20095692651256\gamma^3 + 683797320728\gamma^4 + 570672523205\gamma^5 + 4096852328\gamma^6 - 7877990596\gamma^7 - 128945635\gamma^8 \\
& + 51163245\gamma^9 + 298746\gamma^{10} - 120582\gamma^{11} + 3465\gamma^{12}) - 4096n^3(13646693571598800 + 1685720571113376\gamma - 376603828334328\gamma^2 \\
& - 85608337356920\gamma^3 + 5670030461683\gamma^4 + 1785539418880\gamma^5 - 44773312724\gamma^6 - 17127175016\gamma^7 + 310817878\gamma^8 + 67129020\gamma^9 \\
& - 2226168\gamma^{10} - 58212\gamma^{11} + 4851\gamma^{12}) + 98402304(274337280000 + 160030080000\gamma - 11748024000\gamma^2 - 20188854000\gamma^3 \\
& - 1151567088\gamma^4 + 1010657032\gamma^5 + 100213036\gamma^6 - 25763815\gamma^7 - 3074269\gamma^8 + 353661\gamma^9 + 46263\gamma^{10} - 2485\gamma^{11} - 343\gamma^{12} + 7\gamma^{13} \\
& + \gamma^{14}) + 49152n(-1610060348736000 - 494041960843200\gamma + 68186313193680\gamma^2 + 45834658472064\gamma^3 + 255693733680\gamma^4 \\
& - 1739093857732\gamma^5 - 81566227897\gamma^6 + 33137490232\gamma^7 + 1973485690\gamma^8 - 323904966\gamma^9 - 17844666\gamma^{10} + 1457764\gamma^{11} + 40810\gamma^{12} \\
& - 2002\gamma^{13} + 143\gamma^{14}))/((14549535(-20+n)(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma)) \\
& (n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma)) \\
& (n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(9, 0) \cong & -((8192(-7+n)(-5+n)(-3+n)(-5+\gamma)(-4+\gamma)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/(315(-8+n)(-6+n)(-4+n)(-8+n+2\gamma) \\
& (-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(9, 2) \cong & -((8192(-105 + 71n - 15n^2 + n^3)(-720 + 324\gamma + 944\gamma^2 - 441\gamma^3 - 231\gamma^4 + 126\gamma^5 + 6\gamma^6 - 9\gamma^7 + \gamma^8)(-132n^2 + 11n^3 - 4n(-79 \\
& - 2\gamma + \gamma^2) - 8(20 + 9\gamma + \gamma^2)))/(3465(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\
& (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(9, 4) \cong & -((8192(-210 + 37n + 41n^2 - 13n^3 + n^4)(-720 + 324\gamma + 944\gamma^2 - 441\gamma^3 - 231\gamma^4 + 126\gamma^5 + 6\gamma^6 - 9\gamma^7 + \gamma^8)(-4004n^4 + 143n^5 \\
& - 52n^3(-763 - 4\gamma + 2\gamma^2) + 208n^2(-804 - 23\gamma + 6\gamma^2) + 48n(5988 + 690\gamma - 55\gamma^2 - 4\gamma^3 + \gamma^4) + 192(-720 - 324\gamma - 16\gamma^2 + 9\gamma^3 + \gamma^4))) \\
& /((45045(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma) \\
& (n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),
\end{aligned}$$

$$\begin{aligned}
F_{3,n,\gamma}(9, 6) \cong & -((8192(-840 - 62n + 201n^2 - 11n^3 - 9n^4 + n^5)(-720 + 324\gamma + 944\gamma^2 - 441\gamma^3 - 231\gamma^4 + 126\gamma^5 + 6\gamma^6 - 9\gamma^7 + \gamma^8)(-6864n^6 \\
& + 143n^7 - 52n^5(-2558 - 6\gamma + 3\gamma^2) + 312n^4(-4276 - 41\gamma + 15\gamma^2) + 16n^3(460103 + 12450\gamma - 3186\gamma^2 - 36\gamma^3 + 9\gamma^4) - 96n^2(226916 \\
& + 15163\gamma - 2485\gamma^2 - 150\gamma^3 + 18\gamma^4) - 64n(-475524 - 76896\gamma + 6331\gamma^2 + 1806\gamma^3 - 32\gamma^4 - 6\gamma^5 + \gamma^6) - 384(35280 + 15876\gamma + 64\gamma^2 \\
& - 765\gamma^3 - 65\gamma^4 + 9\gamma^5 + \gamma^6)))/(45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma))
\end{aligned}$$

$$(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))),$$

$$F_{3,n,\gamma}(9,8) \cong -((8192(-5040-1212n+1144n^2+135n^3-65n^4-3n^5+n^6)(-720+324\gamma+944\gamma^2-441\gamma^3-231\gamma^4+126\gamma^5+6\gamma^6-9\gamma^7+\gamma^8) \\ (-175032n^8+2431n^9-1768n^7(-3051-4\gamma+2\gamma^2)+7072n^6(-13142-63\gamma+26\gamma^2)+272n^5(3603471+42788\gamma-14458\gamma^2-72\gamma^3 \\ +18\gamma^4)-2176n^4(2986871+74835\gamma-20405\gamma^2-405\gamma^3+72\gamma^4)-2176n^3(-12275618-603226\gamma+129097\gamma^2+7140\gamma^3-829\gamma^4 \\ -12\gamma^5+2\gamma^6)+8704n^2(-7359332-696870\gamma+110321\gamma^2+15390\gamma^3-912\gamma^4-81\gamma^5+6\gamma^6)+14336(-2257920-1016064\gamma \\ +31184\gamma^2+64836\gamma^3+4224\gamma^4-1341\gamma^5-129\gamma^6+9\gamma^7+\gamma^8)+256n(303426816+57766896\gamma-5795020\gamma^2-2204540\gamma^3+4323\gamma^4 \\ +24868\gamma^5+66\gamma^6-56\gamma^7+7\gamma^8)))/(765765(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma)) \\ (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\ (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))),$$

$$F_{3,n,\gamma}(9,10) \cong -((8192(-40320-14736n+7940n^2+2224n^3-385n^4-89n^5+5n^6+n^7)(-720+324\gamma+944\gamma^2-441\gamma^3-231\gamma^4+126\gamma^5+6\gamma^6 \\ -9\gamma^7+\gamma^8)(-4618900n^{10}+46189n^{11}-83980n^9(-2433-2\gamma+\gamma^2)+167960n^8(-31340-89\gamma+39\gamma^2)+5168n^7(16921989 \\ +111700\gamma-42860\gamma^2-120\gamma^3+30\gamma^4)-103360n^6(9475267+122635\gamma-41085\gamma^2-414\gamma^3+84\gamma^4)-103360n^5(-72532619 \\ -1684262\gamma+489585\gamma^2+12060\gamma^3-1942\gamma^4-12\gamma^5+2\gamma^6)+206720n^4(-188085000-7484969\gamma+1864819\gamma^2+96090\gamma^3-11750\gamma^4 \\ -294\gamma^5+34\gamma^6)-97280n^2(2815120656+324460710\gamma-53971440\gamma^2-10678711\gamma^3+491196\gamma^4+119705\gamma^5-3015\gamma^6-406\gamma^7 \\ +21\gamma^8)+4864n^3(27157306356+1824629100\gamma-38057050\gamma^2-38434180\gamma^3+3255355\gamma^4+244700\gamma^5-17180\gamma^6-280\gamma^7+35\gamma^8) \\ -645120(182891520+82301184\gamma-4783824\gamma^2-6267780\gamma^3-310960\gamma^4+173457\gamma^5+14673\gamma^6-2070\gamma^7-210\gamma^8+9\gamma^9+\gamma^{10}) \\ -9216n(-32455624320-6821086320\gamma+808887732\gamma^2+342411500\gamma^3-1042705\gamma^4-6184610\gamma^5-145239\gamma^6+42700\gamma^7+525\gamma^8 \\ -70\gamma^9+7\gamma^{10}))/((14549535(-18+n)(-16+n)(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma)) \\ (n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma)) \\ (n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma))(n-2(8+\gamma))(n-2(9+\gamma))),$$

$$F_{3,n,\gamma}(9,12) \cong -((8192(-403200-187680n+64664n^2+30180n^3-1626n^4-1275n^5-39n^6+15n^7+n^8)(-720+324\gamma+944\gamma^2-441\gamma^3 \\ -231\gamma^4+126\gamma^5+6\gamma^6-9\gamma^7+\gamma^8)(-6096948n^{12}+46189n^{13}-16796n^{11}(-21649-12\gamma+6\gamma^2)+201552n^{10}(-64260-119\gamma+54\gamma^2) \\ +15504n^9(19787043+82110\gamma-33845\gamma^2-60\gamma^3+15\gamma^4)-62016n^8(82068049+640890\gamma-239950\gamma^2-1455\gamma^3+315\gamma^4) \\ -20672n^7(-2933583931-39191328\gamma+13310024\gamma^2+185880\gamma^3-34570\gamma^4-120\gamma^5+20\gamma^6)+248064n^6(-2108961030 \\ -45579171\gamma+13993976\gamma^2+379980\gamma^3-59840\gamma^4-750\gamma^5+100\gamma^6)+4864n^5(667822242976+22628880210\gamma-6239644435\gamma^2 \\ -301710600\gamma^3+39246530\gamma^4+1225740\gamma^5-125830\gamma^6-840\gamma^7+105\gamma^8)-58368n^4(243572467376+12780188120\gamma \\ -3127126520\gamma^2-257579105\gamma^3+26477130\gamma^4+1813000\gamma^5-132180\gamma^6-3710\gamma^7+315\gamma^8)+12288n^2(-6368020636320 \\ -834663174336\gamma+147715970144\gamma^2+35252544640\gamma^3-1532975810\gamma^4-581953235\gamma^5+5717584\gamma^6+4106620\gamma^7-36820\gamma^8 \\ -9765\gamma^9+378\gamma^{10})-1024n^3(-41112408113136-3360220586568\gamma+713892656992\gamma^2+98954543460\gamma^3-7366930655\gamma^4 \\ -1097692560\gamma^5+46730224\gamma^6+4540200\gamma^7-217035\gamma^8-3780\gamma^9+378\gamma^{10}))+1622016(-18289152000-8230118400\gamma \\ +661273920\gamma^2+709079184\gamma^3+26312176\gamma^4-23613480\gamma^5-1778260\gamma^6+380457\gamma^7+35673\gamma^8-2970\gamma^9-310\gamma^{10}+9\gamma^{11}+\gamma^{12}) \\ +12288n(6410086502400+1441180952640\gamma-194444840304\gamma^2-86735738232\gamma^3+658841216\gamma^4+2055881850\gamma^5+57314323\gamma^6 \\ -22558536\gamma^7-792627\gamma^8+105930\gamma^9+1861\gamma^{10}-132\gamma^{11}+11\gamma^{12}))/((14549535(-20+n)(-18+n)(-16+n)(-14+n)(-12+n) \\ (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-20+n+2\gamma) \\ (-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\ (n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma))),$$

$$F_{3,n,\gamma}(11,0) \cong (65536(-9+n)(-7+n)(-5+n)(-3+n)(-6+\gamma)(-5+\gamma)(-16+\gamma^2)(-9+\gamma^2)(-4+\gamma^2)(-1+\gamma^2))/((693(-10+n)(-8+n)(-6+n) \\ (-4+n)(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))),$$

$$F_{3,n,\gamma}(11,2) \cong (65536(945-744n+206n^2-24n^3+n^4)(17280-6336\gamma-24024\gamma^2+9020\gamma^3+7370\gamma^4-3003\gamma^5-627\gamma^6+330\gamma^7-11\gamma^9+\gamma^{10}) \\ (-182n^2+13n^3+n(452+8\gamma-4\gamma^2)-8(30+11\gamma+\gamma^2)))/(9009(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-6+\gamma)) \\ (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))),$$

$$F_{3,n,\gamma}(11,4) \cong (65536(1890-543n-332n^2+158n^3-22n^4+n^5)(17280-6336\gamma-24024\gamma^2+9020\gamma^3+7370\gamma^4-3003\gamma^5-627\gamma^6+330\gamma^7-11\gamma^9 \\ +\gamma^{10})(-2080n^4+65n^5+n^3(22980+80\gamma-40\gamma^2)+80n^2(-1298-27\gamma+7\gamma^2)+16n(11690+1076\gamma-79\gamma^2-4\gamma^3+\gamma^4)+64(-1470 \\ -539\gamma-19\gamma^2+11\gamma^3+\gamma^4)))/(45045(-14+n)(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(n+2(-7+\gamma))(n+2(-6+\gamma)) \\ (n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma)) \\ (n-2(7+\gamma))),$$

$$F_{3,n,\gamma}(11,6) \cong (65536(7560-282n-1871n^2+300n^3+70n^4-18n^5+n^6)(17280-6336\gamma-24024\gamma^2+9020\gamma^3+7370\gamma^4-3003\gamma^5-627\gamma^6 \\ +330\gamma^7-11\gamma^9+\gamma^{10})(-59670n^6+1105n^7-340n^5(-3784-6\gamma+3\gamma^2)+2040n^4(-6939-47\gamma+17\gamma^2)+272n^3(309935+6228\gamma \\ -1542\gamma^2-12\gamma^3+3\gamma^4)-1632n^2(162420+8457\gamma-1308\gamma^2-58\gamma^3+7\gamma^4)-1920(94080+34496\gamma-254\gamma^2-1243\gamma^3-83\gamma^4 \\ +11\gamma^5+\gamma^6)-64n(-6069840-790842\gamma+62633\gamma^2+13488\gamma^3-262\gamma^4-30\gamma^5+5\gamma^6)))/(765765(-16+n)(-14+n)(-12+n) \\ (-10+n)(-8+n)(-6+n)(-4+n)(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma)$$

$$\begin{aligned}
& (-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma)), \\
F_{3,n,\gamma}(11, 8) & \cong (65536(45360 + 5868n - 11508n^2 - 71n^3 + 720n^4 - 38n^5 - 12n^6 + n^7)(17280 - 6336\gamma - 24024\gamma^2 + 9020\gamma^3 + 7370\gamma^4 - 3003\gamma^5 \\
& - 627\gamma^6 + 330\gamma^7 - 11\gamma^9 + \gamma^{10})(-1679600n^8 + 20995n^9 - 12920n^7(-4425 - 4\gamma + 2\gamma^2) + 51680n^6(-20905 - 71\gamma + 29\gamma^2) \\
& + 5168n^5(2398725 + 20776\gamma - 6854\gamma^2 - 24\gamma^3 + 6\gamma^4) - 41344n^4(2144285 + 40372\gamma - 10588\gamma^2 - 153\gamma^3 + 27\gamma^4) \\
& - 2432n^3(-160055320 - 6081244\gamma + 1236471\gamma^2 + 51456\gamma^3 - 5879\gamma^4 - 60\gamma^5 + 10\gamma^6) + 9728n^2(-101526480 - 7621301\gamma \\
& + 1145104\gamma^2 + 122874\gamma^3 - 7291\gamma^4 - 465\gamma^5 + 35\gamma^6) + 71680(-7620480 - 2794176\gamma + 114654\gamma^2 + 135179\gamma^3 + 6469\gamma^4 - 2134\gamma^5 \\
& - 164\gamma^6 + 11\gamma^7 + \gamma^8) + 1280n(981094464 + 150946008\gamma - 14890472\gamma^2 - 4289672\gamma^3 + 32591\gamma^4 + 35944\gamma^5 - 46\gamma^6 - 56\gamma^7 + 7\gamma^8)) \\
& / (14549535(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{3,n,\gamma}(11, 10) & \cong (65536(362880 + 92304n - 86196n^2 - 12076n^3 + 5689n^4 + 416n^5 - 134n^6 - 4n^7 + n^8)(17280 - 6336\gamma - 24024\gamma^2 + 9020\gamma^3 \\
& + 7370\gamma^4 - 3003\gamma^5 - 627\gamma^6 + 330\gamma^7 - 11\gamma^9 + \gamma^{10})(-461890n^{10} + 4199n^{11} - 6460n^9(-3467 - 2\gamma + \gamma^2) + 12920n^8(-48760 - 99\gamma \\
& + 43\gamma^2) + 5168n^7(2201459 + 10592\gamma - 3988\gamma^2 - 8\gamma^3 + 2\gamma^4) - 10336n^6(13334075 + 128282\gamma - 41728\gamma^2 - 308\gamma^3 + 62\gamma^4) \\
& - 6080n^5(-186687961 - 3285686\gamma + 918189\gamma^2 + 16928\gamma^3 - 2682\gamma^4 - 12\gamma^5 + 2\gamma^6) + 12160n^4(-517739650 - 15913535\gamma \\
& + 3782793\gamma^2 + 148742\gamma^3 - 17808\gamma^4 - 330\gamma^5 + 38\gamma^6) + 256n^3(88774793444 + 4689146984\gamma - 930791746\gamma^2 - 72794036\gamma^3 \\
& + 6080619\gamma^4 + 341600\gamma^5 - 23980\gamma^6 - 280\gamma^7 + 35\gamma^8) - 512n^2(97095130680 + 8939700484\gamma - 1427895236\gamma^2 - 219584926\gamma^3 \\
& + 10536299\gamma^4 + 1843050\gamma^5 - 51200\gamma^6 - 4620\gamma^7 + 245\gamma^8) - 30720(762048000 + 279417600\gamma - 19085880\gamma^2 - 16312076\gamma^3 \\
& - 532246\gamma^4 + 348579\gamma^5 + 22869\gamma^6 - 3234\gamma^7 - 264\gamma^8 + 11\gamma^9 + \gamma^{10}) - 1024n(-55556020800 - 9451019280\gamma + 1116970228\gamma^2 \\
& + 358739000\gamma^3 - 3798635\gamma^4 - 4926730\gamma^5 - 76271\gamma^6 + 25760\gamma^7 + 195\gamma^8 - 30\gamma^9 + 3\gamma^{10}))/ (2909907(-20 + n)(-18 + n)(-16 + n) \\
& (-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma)) \\
& (n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{3,n,\gamma}(13, 0) & \cong -((1048576(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-7 + \gamma)(-6 + \gamma)(-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2)) \\
& / (3003(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma) \\
& (n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))), \\
F_{3,n,\gamma}(13, 2) & \cong -((1048576(-10395 + 9129n - 3010n^2 + 470n^3 - 35n^4 + n^5)(-604800 + 187200\gamma + 870792\gamma^2 - 273988\gamma^3 - 300014\gamma^4 + 99385\gamma^5 \\
& + 35321\gamma^6 - 13299\gamma^7 - 1287\gamma^8 + 715\gamma^9 - 13\gamma^{10} - 13\gamma^{11} + \gamma^{12})(-240n^2 + 15n^3 + n(612 + 8\gamma - 4\gamma^2) - 8(42 + 13\gamma + \gamma^2))) \\
& / (45045(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma) \\
& (-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{3,n,\gamma}(13, 4) & \cong -((1048576(-20790 + 7863n + 3109n^2 - 2070n^3 + 400n^4 - 33n^5 + n^6)(-604800 + 187200\gamma + 870792\gamma^2 - 273988\gamma^3 - 300014\gamma^4 \\
& + 99385\gamma^5 + 35321\gamma^6 - 13299\gamma^7 - 1287\gamma^8 + 715\gamma^9 - 13\gamma^{10} - 13\gamma^{11} + \gamma^{12})(-9180n^4 + 255n^5 - 68n^3(-1641 - 4\gamma + 2\gamma^2) \\
& + 272n^2(-1959 - 31\gamma + 8\gamma^2) + 48n(20704 + 1582\gamma - 107\gamma^2 - 4\gamma^3 + \gamma^4) + 192(-2688 - 832\gamma - 22\gamma^2 + 13\gamma^3 + \gamma^4))) \\
& / (765765(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma)) \\
& (n - 2(8 + \gamma))), \\
F_{3,n,\gamma}(13, 6) & \cong -((1048576(-83160 + 10662n + 20299n^2 - 5171n^3 - 470n^4 + 268n^5 - 29n^6 + n^7)(-604800 + 187200\gamma + 870792\gamma^2 - 273988\gamma^3 \\
& - 300014\gamma^4 + 99385\gamma^5 + 35321\gamma^6 - 13299\gamma^7 - 1287\gamma^8 + 715\gamma^9 - 13\gamma^{10} - 13\gamma^{11} + \gamma^{12})(-96900n^6 + 1615n^7 - 1292n^5(-1778 - 2\gamma \\
& + \gamma^2) + 2584n^4(-10602 - 53\gamma + 19\gamma^2) + 304n^3(571789 + 8894\gamma - 2140\gamma^2 - 12\gamma^3 + 3\gamma^4) - 608n^2(943044 + 39821\gamma - 5815\gamma^2 \\
& - 198\gamma^3 + 24\gamma^4) - 1920(217728 + 67392\gamma - 906\gamma^2 - 1885\gamma^3 - 103\gamma^4 + 13\gamma^5 + \gamma^6) - 64n(-13611888 - 1481910\gamma + 111275\gamma^2 \\
& + 19170\gamma^3 - 382\gamma^4 - 30\gamma^5 + 5\gamma^6)))/ (4849845(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{3,n,\gamma}(13, 8) & \cong -((1048576(-498960 - 19188n + 132456n^2 - 10727n^3 - 7991n^4 + 1138n^5 + 94n^6 - 23n^7 + n^8)(-604800 + 187200\gamma + 870792\gamma^2 \\
& - 273988\gamma^3 - 300014\gamma^4 + 99385\gamma^5 + 35321\gamma^6 - 13299\gamma^7 - 1287\gamma^8 + 715\gamma^9 - 13\gamma^{10} - 13\gamma^{11} + \gamma^{12})(-426360n^8 + 4845n^9 \\
& - 2584n^7(-6141 - 4\gamma + 2\gamma^2) + 10336n^6(-31491 - 79\gamma + 32\gamma^2) + 304n^5(13221867 + 86956\gamma - 28106\gamma^2 - 72\gamma^3 + 18\gamma^4) \\
& - 2432n^4(12600288 + 185441\gamma - 46945\gamma^2 - 513\gamma^3 + 90\gamma^4) - 128n^3(-1109694258 - 33888506\gamma + 6555997\gamma^2 + 213516\gamma^3 \\
& - 24009\gamma^4 - 180\gamma^5 + 30\gamma^6) + 512n^2(-736032180 - 45471224\gamma + 6459694\gamma^2 + 557208\gamma^3 - 32595\gamma^4 - 1575\gamma^5 + 120\gamma^6) \\
& + 1280n(388108800 + 50005584\gamma - 4750836\gamma^2 - 1099556\gamma^3 + 11749\gamma^4 + 7108\gamma^5 - 26\gamma^6 - 8\gamma^7 + \gamma^8) + 10240(-21772800 \\
& - 6739200\gamma + 308328\gamma^2 + 255892\gamma^3 + 9394\gamma^4 - 3185\gamma^5 - 203\gamma^6 + 13\gamma^7 + \gamma^8)))/ (14549535(-20 + n)(-18 + n)(-16 + n)(-14 + n) \\
& (-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma)) \\
& (n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{3,n,\gamma}(15, 0) & \cong (8388608(-13 + n)(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-8 + \gamma)(-7 + \gamma)(-36 + \gamma^2)(-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)
\end{aligned}$$

$$\begin{aligned}
& (-4 + \gamma^2)(-1 + \gamma^2)/(6435(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma)) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))), \\
F_{3,n,\gamma}(15, 2) & \cong (8388608(135135 - 129072n + 48259n^2 - 9120n^3 + 925n^4 - 48n^5 + n^6)(29030400 - 7776000\gamma - 42777216\gamma^2 + 11597040\gamma^3 \\
& + 15819440\gamma^4 - 4444440\gamma^5 - 2194192\gamma^6 + 667095\gamma^7 + 123695\gamma^8 - 45045\gamma^9 - 2093\gamma^{10} + 1365\gamma^{11} - 35\gamma^{12} - 15\gamma^{13} + \gamma^{14}) \\
& (-306n^2 + 17n^3 + n(796 + 8\gamma - 4\gamma^2) - 8(56 + 15\gamma + \gamma^2))/(109395(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma)) \\
& (n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{3,n,\gamma}(15, 4) & \cong (8388608(270270 - 123009n - 32554n^2 + 30019n^3 - 7270n^4 + 829n^5 - 46n^6 + n^7)(29030400 - 7776000\gamma - 42777216\gamma^2 \\
& + 11597040\gamma^3 + 15819440\gamma^4 - 4444440\gamma^5 - 2194192\gamma^6 + 667095\gamma^7 + 123695\gamma^8 - 45045\gamma^9 - 2093\gamma^{10} + 1365\gamma^{11} - 35\gamma^{12} - 15\gamma^{13} \\
& + \gamma^{14})(-12920n^4 + 323n^5 - 76n^3(-2251 - 4\gamma + 2\gamma^2) + 304n^2(-2811 - 35\gamma + 9\gamma^2) + 48n(34110 + 2224\gamma - 139\gamma^2 - 4\gamma^3 + \gamma^4) \\
& + 192(-4536 - 1215\gamma - 25\gamma^2 + 15\gamma^3 + \gamma^4))/(2078505(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{3,n,\gamma}(15, 6) & \cong (8388608(1081080 - 221766n - 253225n^2 + 87522n^3 + 939n^4 - 3954n^5 + 645n^6 - 42n^7 + n^8)(29030400 - 7776000\gamma - 42777216\gamma^2 \\
& + 11597040\gamma^3 + 15819440\gamma^4 - 4444440\gamma^5 - 2194192\gamma^6 + 667095\gamma^7 + 123695\gamma^8 - 45045\gamma^9 - 2093\gamma^{10} + 1365\gamma^{11} - 35\gamma^{12} - 15\gamma^{13} \\
& + \gamma^{14})(-149226n^6 + 2261n^7 - 532n^5(-7244 - 6\gamma + 3\gamma^2) + 3192n^4(-15467 - 59\gamma + 21\gamma^2) + 112n^3(2951771 + 36660\gamma - 8604\gamma^2 \\
& - 36\gamma^3 + 9\gamma^4) - 672n^2(1687240 + 59497\gamma - 8218\gamma^2 - 222\gamma^3 + 27\gamma^4) - 320n(-5537700 - 517068\gamma + 36625\gamma^2 + 5244\gamma^3 - 104\gamma^4 \\
& - 6\gamma^5 + \gamma^6) - 1920(453600 + 121500\gamma - 2036\gamma^2 - 2715\gamma^3 - 125\gamma^4 + 15\gamma^5 + \gamma^6))/(14549535(-20 + n)(-18 + n)(-16 + n)(-14 + n) \\
& (-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma)) \\
& (n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{3,n,\gamma}(17, 0) & \cong -((536870912(-15 + n)(-13 + n)(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-9 + \gamma)(-8 + \gamma)(-49 + \gamma^2)(-36 + \gamma^2)(-25 + \gamma^2) \\
& (-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2))/(109395(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-8 + \gamma)) \\
& (n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma)) \\
& (n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))), \\
F_{3,n,\gamma}(17, 2) & \cong -((536870912(-2027025 + 2071215n - 852957n^2 + 185059n^3 - 22995n^4 + 1645n^5 - 63n^6 + n^7)(-1828915200 + 431827200\gamma \\
& + 2739547008\gamma^2 - 652835088\gamma^3 - 1062596016\gamma^4 + 259957880\gamma^5 + 162942416\gamma^6 - 42083041\gamma^7 - 11321167\gamma^8 + 3257540\gamma^9 \\
& + 345644\gamma^{10} - 126854\gamma^{11} - 2618\gamma^{12} + 2380\gamma^{13} - 68\gamma^{14} - 17\gamma^{15} + \gamma^{16})(-380n^2 + 19n^3 - 4n(-251 - 2\gamma + \gamma^2) - 8(72 + 17\gamma + \gamma^2))) \\
& / (2078505(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma)) \\
& (n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{3,n,\gamma}(17, 4) & \cong -((536870912(-4054050 + 2115405n + 365301n^2 - 482839n^3 + 139069n^4 - 19705n^5 + 1519n^6 - 61n^7 + n^8)(-1828915200 \\
& + 431827200\gamma + 2739547008\gamma^2 - 652835088\gamma^3 - 1062596016\gamma^4 + 259957880\gamma^5 + 162942416\gamma^6 - 42083041\gamma^7 - 11321167\gamma^8 \\
& + 3257540\gamma^9 + 345644\gamma^{10} - 126854\gamma^{11} - 2618\gamma^{12} + 2380\gamma^{13} - 68\gamma^{14} - 17\gamma^{15} + \gamma^{16})(-5852n^4 + 133n^5 - 28n^3(-2991 - 4\gamma + 2\gamma^2) \\
& + 112n^2(-3878 - 39\gamma + 10\gamma^2) + 16n(53140 + 3018\gamma - 175\gamma^2 - 4\gamma^3 + \gamma^4) + 64(-7200 - 1700\gamma - 28\gamma^2 + 17\gamma^3 + \gamma^4))) \\
& / (14549535(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma)) \\
& (n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma)) \\
& (n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{3,n,\gamma}(19, 0) & \cong (4294967296(-17 + n)(-15 + n)(-13 + n)(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-10 + \gamma)(-9 + \gamma)(-64 + \gamma^2)(-49 + \gamma^2)(-36 + \gamma^2) \\
& (-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2))/(230945(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n) \\
& (n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma)) \\
& (n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))), \\
F_{3,n,\gamma}(19, 2) & \cong -((4294967296(-17 + n)(-15 + n)(-13 + n)(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-10 + \gamma)(-9 + \gamma)(-64 + \gamma^2)(-49 + \gamma^2) \\
& (-36 + \gamma^2)(-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2)(462n^2 - 21n^3 + 4n(-309 - 2\gamma + \gamma^2) + 8(90 + 19\gamma + \gamma^2))) \\
& / (4849845(-20 + n)(-18 + n)(-16 + n)(-14 + n)(-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma)) \\
& (n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma)(-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma)) \\
& (n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma))(n - 2(9 + \gamma))(n - 2(10 + \gamma))), \\
F_{3,n,\gamma}(21, 0) & \cong -((68719476736(-19 + n)(-17 + n)(-15 + n)(-13 + n)(-11 + n)(-9 + n)(-7 + n)(-5 + n)(-3 + n)(-11 + \gamma)(-10 + \gamma)(-81 + \gamma^2) \\
& (-64 + \gamma^2)(-49 + \gamma^2)(-36 + \gamma^2)(-25 + \gamma^2)(-16 + \gamma^2)(-9 + \gamma^2)(-4 + \gamma^2)(-1 + \gamma^2))/(969969(-20 + n)(-18 + n)(-16 + n)(-14 + n) \\
& (-12 + n)(-10 + n)(-8 + n)(-6 + n)(-4 + n)(n + 2(-9 + \gamma))(n + 2(-8 + \gamma))(n + 2(-7 + \gamma))(n + 2(-6 + \gamma))(n + 2(-5 + \gamma))(-20 + n + 2\gamma) \\
& (-8 + n + 2\gamma)(-6 + n + 2\gamma)(-4 + n + 2\gamma)(n - 2(2 + \gamma))(n - 2(3 + \gamma))(n - 2(4 + \gamma))(n - 2(5 + \gamma))(n - 2(6 + \gamma))(n - 2(7 + \gamma))(n - 2(8 + \gamma)) \\
& (n - 2(9 + \gamma))(n - 2(10 + \gamma)))
\end{aligned}$$

for $n > 2\gamma + 20$.

The proof of these lemmas is based on the argument in the proof of Lemma 4.4 in [1].

2. A TECHNICAL LEMMA FOR THE COMPUTATION OF THE SECOND DERIVATIVE OF $(J_1' + J_2')(\delta, \tau)$ AT $(\delta, \tau) = (\delta, 0)$

In this section, the explicit values of $\widetilde{G}_{1,m}, \dots, \widetilde{G}_{11,m}$ in Lemma 4.12 in [1] are described in terms of a recurrence relation.

Lemma 2.1. Let $\widetilde{H}_{ab}(x) = f(|\bar{x}|^2)H_{ab}(x)$ and $r = |\bar{x}|$ for any $x = (\bar{x}, x_N) \in \mathbb{R}_+^N$. Set also

$$G_1(r) = f(r^2)^2 \quad \text{and} \quad G_2(r) = 8f(r^2)f'(r^2) + 4r^2f'(r^2)^2.$$

Then

$$\begin{aligned} \widetilde{G}_{1,0}(r) &= G_1'(r)/r, \quad \widetilde{G}_{2,0}(r) = G_2'(r)/r, \quad \widetilde{G}_{3,0}(r) = 0, \quad \widetilde{G}_{4,0}(r) = 2G_2'(r)/r, \quad \widetilde{G}_{5,0}(r) = 2G_2(r), \\ \widetilde{G}_{6,0}(r) &= 2G_1'(r)/r, \\ \widetilde{G}_{7,0}(r) &= 2G_1(r), \quad \widetilde{G}_{8,0}(r) = (G_1'(r)/r)'/r, \quad \widetilde{G}_{9,0}(r) = (G_2'(r)/r)'/r, \quad \widetilde{G}_{10,0}(r) = 0, \quad \widetilde{G}_{11,0}(r) = 2G_2(r). \end{aligned}$$

Furthermore,

$$\begin{aligned} \widetilde{G}_{1,m}(r) &= \widetilde{G}_{1,m-1}''(r) + (n+3)/r \cdot \widetilde{G}_{1,m-1}'(r) + 2\widetilde{G}_{2,m-1}(r) + 2\widetilde{G}_{8,m-1}(r), \\ \widetilde{G}_{2,m}(r) &= \widetilde{G}_{2,m-1}''(r) + (n+7)/r \cdot \widetilde{G}_{2,m-1}'(r) + 2\widetilde{G}_{9,m-1}(r), \\ \widetilde{G}_{3,m}(r) &= 2\widetilde{G}_{1,m-1}(r) + \widetilde{G}_{3,m-1}''(r) + (n-1)/r \cdot \widetilde{G}_{3,m-1}'(r) + \widetilde{G}_{10,m-1}(r), \\ \widetilde{G}_{4,m}(r) &= \widetilde{G}_{4,m-1}''(r) + (n+7)/r \cdot \widetilde{G}_{4,m-1}'(r) + 4\widetilde{G}_{9,m-1}(r), \\ \widetilde{G}_{5,m}(r) &= 4\widetilde{G}_{4,m-1}(r) + \widetilde{G}_{5,m-1}''(r) + (n+3)/r \cdot \widetilde{G}_{5,m-1}'(r), \\ \widetilde{G}_{6,m}(r) &= 2\widetilde{G}_{4,m-1}(r) + \widetilde{G}_{6,m-1}''(r) + (n+3)/r \cdot \widetilde{G}_{6,m-1}'(r) + 4\widetilde{G}_{8,m-1}(r), \\ \widetilde{G}_{7,m}(r) &= 2\widetilde{G}_{5,m-1}(r) + 4\widetilde{G}_{6,m-1}(r) + \widetilde{G}_{7,m-1}''(r) + (n-1)/r \cdot \widetilde{G}_{7,m-1}'(r), \\ \widetilde{G}_{8,m}(r) &= \widetilde{G}_{8,m-1}''(r) + (n+7)/r \cdot \widetilde{G}_{8,m-1}'(r) + 2\widetilde{G}_{9,m-1}(r), \\ \widetilde{G}_{9,m}(r) &= \widetilde{G}_{9,m-1}''(r) + (n+11)/r \cdot \widetilde{G}_{9,m-1}'(r), \\ \widetilde{G}_{10,m}(r) &= 2\widetilde{G}_{8,m-1}(r) + \widetilde{G}_{10,m-1}''(r) + (n+3)/r \cdot \widetilde{G}_{10,m-1}'(r), \\ \widetilde{G}_{11,m}(r) &= 4\widetilde{G}_{4,m-1}(r) + \widetilde{G}_{11,m-1}''(r) + (n+3)/r \cdot \widetilde{G}_{11,m-1}'(r) \end{aligned}$$

for all $m \in \mathbb{N}$.

3. THE HIGH DIMENSIONAL CASE; A LINEAR FUNCTION f

Suppose that $d_0 = 1$ and $n > 2\gamma + 8$.

Lemma 3.1. Let Q be the polynomial in Subsection 5.1 in [1]. Then we have

$$\begin{aligned} Q(t) &= -(a_0^2(-120n^3 + 15n^4 + n^2(340 - 40\gamma^2) + 80n(-5 + 2\gamma^2) + 48(4 - 5\gamma^2 + \gamma^4)))/(120(-4+n)(-1+n)n(-4+n+2\gamma)(n-2(2+\gamma))) \\ &\quad + (27t(-32 - 4n + n^2)(-1190n^7 + 35n^8 - 280n^6(-60 + \gamma^2) + 280n^5(-457 + 23\gamma^2) + 112n^4(5107 - 550\gamma^2 + 8\gamma^4) - 224n^3(6822 - 1400\gamma^2 + 63\gamma^4) \\ &\quad - 128n^2(-18570 + 7077\gamma^2 - 700\gamma^4 + 13\gamma^6) + 128n(-15552 + 11242\gamma^2 - 2093\gamma^4 + 103\gamma^6) + 1280(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)) \\ &\quad - 2(32 + 12n + n^2)(-10080n^7 + 315n^8 - 840n^6(-161 + 2\gamma^2) + 20160n^5(-49 + 2\gamma^2) - 16128n^3(689 - 130\gamma^2 + 6\gamma^4) + 336n^4(12707 - 1190\gamma^2 \\ &\quad + 18\gamma^4) + 9216n(-1522 + 1085\gamma^2 - 203\gamma^4 + 10\gamma^6) - 384n^2(-44158 + 16135\gamma^2 - 1617\gamma^4 + 30\gamma^6) + 8960(576 - 820\gamma^2 + 273\gamma^4 - 30\gamma^6 + \gamma^8)) \\ &\quad / (2520(-8+n)(-6+n)(-4+n)(-1+n)n(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))) \end{aligned}$$

for $t \in \mathbb{R}$. In particular the coefficient of t^2 of $Q(t)$ is negative for any $n \geq 52$ and $0 < \gamma < 1$.

Lemma 3.2. Let $\text{disc}(Q)$ be the determinant of the quadratic polynomial Q in the previous lemma, which depends on $(n, \gamma) \in \mathbb{N} \times (0, 1)$. Then it holds that $\text{disc}(Q)(n, \gamma) = C(n, \gamma)R(n, \gamma)$ where

$$C(n, \gamma)^{-1} = 2116800(-8+n)(-6+n)^2(-4+n)^2(-1+n)^2n^2(-8+n-2\gamma)(-6+n-2\gamma)^2(-4+n-2\gamma)^2(-8+n+2\gamma)(-6+n+2\gamma)^2(-4+n+2\gamma)^2$$

and

$$\begin{aligned} R(n, \gamma) &= 119370562928640 - 627983744237568n + 1538520627806208n^2 - 2290322424987648n^3 + 2283791903096832n^4 - 1588797829545984n^5 \\ &\quad + 777213314433024n^6 - 259168292339712n^7 + 51196030470144n^8 - 1152295070976n^9 - 2887176741120n^{10} + 1047831099840n^{11} \\ &\quad - 208557908160n^{12} + 26851231680n^{13} - 2262682800n^{14} + 118143900n^{15} - 3307500n^{16} + 33075n^{17} - 332413859266560\gamma^2 \\ &\quad + 1309993517187072n\gamma^2 - 2379452730310656n^2\gamma^2 + 2576148938096640n^3\gamma^2 - 1820990063771648n^4\gamma^2 + 862594418868224n^5\gamma^2 \\ &\quad - 263777134329856n^6\gamma^2 + 41360887450624n^7\gamma^2 + 3375829201920n^8\gamma^2 - 3706490000640n^9\gamma^2 + 1026635205120n^{10}\gamma^2 - 164714605440n^{11}\gamma^2 \\ &\quad + 16591713600n^{12}\gamma^2 - 1015417200n^{13}\gamma^2 + 33163200n^{14}\gamma^2 - 396900n^{15}\gamma^2 + 334302051041280\gamma^4 - 948649385263104n\gamma^4 \\ &\quad + 1243533739556864n^2\gamma^4 - 957217090371584n^3\gamma^4 + 460452164960256n^4\gamma^4 - 132988321492992n^5\gamma^4 + 15972533850112n^6\gamma^4 \\ &\quad + 3653983499264n^7\gamma^4 - 2112741163008n^8\gamma^4 + 469118103552n^9\gamma^4 - 59480762880n^{10}\gamma^4 + 4355621760n^{11}\gamma^4 - 160923840n^{12}\gamma^4 \\ &\quad + 1846320n^{13}\gamma^4 - 152626916229120\gamma^6 + 314359695015936n\gamma^6 - 290407050641408n^2\gamma^6 + 149479305789440n^3\gamma^6 - 42068051574784n^4\gamma^6 \\ &\quad + 364306324672n^5\gamma^6 + 1691026563072n^6\gamma^6 - 704002510848n^7\gamma^6 + 124159150080n^8\gamma^6 - 11458460160n^9\gamma^6 + 482657280n^{10}\gamma^6 \\ &\quad - 3716160n^{11}\gamma^6 + 35392082411520\gamma^8 - 51716274782208n\gamma^8 + 31486023303168n^2\gamma^8 - 9092449763328n^3\gamma^8 + 518961938432n^4\gamma^8 \\ &\quad + 459326242816n^5\gamma^8 - 147967963136n^6\gamma^8 + 19361205248n^7\gamma^8 - 1017332736n^8\gamma^8 + 1876224n^9\gamma^8 - 4271458222080\gamma^{10} \\ &\quad + 4131839803392n\gamma^{10} - 1351404486656n^2\gamma^{10} + 54677504000n^3\gamma^{10} + 77487685632n^4\gamma^{10} - 19287453696n^5\gamma^{10} + 1547485184n^6\gamma^{10} \\ &\quad + 308224n^7\gamma^{10} + 253294018560\gamma^{12} - 136571781120n\gamma^{12} + 3713269760n^2\gamma^{12} + 7648706560n^3\gamma^{12} - 1420574720n^4\gamma^{12} + 5672960n^5\gamma^{12} \\ &\quad - 5756682240n^6\gamma^{12} + 924057600n^7\gamma^{12} + 578027520n^8\gamma^{12} - 3194880n^9\gamma^{12}. \end{aligned}$$

Moreover the function $\widetilde{R}(n)$, a lower bound of $R(n, \gamma)$ is given by

$$\widetilde{R}(n) = -369947427471360 - 1628485976064000n - 1132690557632512n^2 - 3256631968317440n^3 + 420732367175680n^4 - 1721805438492672n^5$$

$$+ 513288212140032n^6 - 259872294850560n^7 + 49082271974400n^8 - 4870243531776n^9 - 2946657504000n^{10} + 883112778240n^{11} \\ - 208718832000n^{12} + 25835814480n^{13} - 2262682800n^{14} + 117747000n^{15} - 3307500n^{16} + 33075n^{17}.$$

4. THE LOW DIMENSIONAL CASE; A QUARTIC POLYNOMIAL f

We assume that $d_0 = 4$ and $n > 2\gamma + 20$ throughout this section. For the sake of brevity, we write $F_1 = F_{1,n,\gamma}$ and so on.

The following lemma generalizes Proposition 4.8 in [1].

Lemma 4.1. *Let*

$$P_{31}(t) = a_0^2/n \cdot F_1(1, 2)t^2 + ((2a_0a_1)/n + (4a_0a_1)/(n(2+n)))F_1(1, 4)t^3 + (a_1^2/n + (2a_0a_2)/n + (6a_1^2)/(n(2+n)) + (8a_0a_2)/(n(2+n)))F_1(1, 6)t^4 \\ + ((2a_1a_2)/n + (2a_0a_3)/n + (20a_1a_2)/(n(2+n)) + (12a_0a_3)/(n(2+n)))F_1(1, 8)t^5 + (a_2^2/n + (2a_1a_3)/n + (2a_0a_4)/n + (16a_2^2)/(n(2+n)) \\ + (28a_1a_3)/(n(2+n)) + (16a_0a_4)/(n(2+n)))F_1(1, 10)t^6 + ((2a_2a_3)/n + (2a_1a_4)/n + (44a_2a_3)/(n(2+n)) + (36a_1a_4)/(n(2+n)))F_1(1, 12)t^7 \\ + (a_3^2/n + (2a_2a_4)/n + (30a_3^2)/(n(2+n)) + (56a_2a_4)/(n(2+n)))F_1(1, 14)t^8 + ((2a_3a_4)/n + (76a_3a_4)/(n(2+n)))F_1(1, 16)t^9 \\ + (a_4^2/n + (48a_4^2)/(n(2+n)))F_1(1, 18)t^{10}, \\ P_{31}(t) = 2a_0^2F_1(3, 0)t^2 + (8a_0a_1 + (32a_0a_1)/n)F_1(3, 2)t^3 + (6a_1^2 + 12a_0a_2 + (48a_1^2)/n + (80a_0a_2)/n + (12a_1^2)/(2+n) + (16a_0a_2)/(2+n) \\ + (96a_1^2)/(n(2+n)) + (128a_0a_2)/(n(2+n)))F_1(3, 4)t^4 + (16a_1a_2 + 16a_0a_3 + (176a_1a_2)/n + (144a_0a_3)/n + (80a_1a_2)/(2+n) + (48a_0a_3)/(2+n) \\ + (800a_1a_2)/(n(2+n)) + (480a_0a_3)/(n(2+n)))F_1(3, 6)t^5 + (10a_2^2 + 20a_1a_3 + 20a_0a_4 + (144a_2^2)/n + (272a_1a_3)/n + (224a_0a_4)/n + (96a_2^2)/(2+n) \\ + (168a_1a_3)/(2+n) + (96a_0a_4)/(2+n) + (1152a_2^2)/(n(2+n)) + (2016a_1a_3)/(n(2+n)) + (1152a_0a_4)/(n(2+n)))F_1(3, 8)t^6 + (24a_2a_3 + 24a_1a_4 \\ + (416a_2a_3)/n + (384a_1a_4)/n + (352a_2a_3)/(2+n) + (288a_1a_4)/(2+n) + (4928a_2a_3)/(n(2+n)) + (4032a_1a_4)/(n(2+n)))F_1(3, 10)t^7 \\ + (14a_3^2 + 28a_2a_4 + (288a_3^2)/n + (560a_2a_4)/n + (300a_3^2)/(2+n) + (560a_2a_4)/(2+n) + (4800a_3^2)/(n(2+n)) + (8960a_2a_4)/(n(2+n)))F_1(3, 12)t^8 \\ + (32a_3a_4 + (752a_3a_4)/n + (912a_3a_4)/(2+n) + (16416a_3a_4)/(n(2+n)))F_1(3, 14)t^9 \\ + (18a_4^2 + (480a_4^2)/n + (672a_4^2)/(2+n) + (13440a_4^2)/(n(2+n)))F_1(3, 16)t^{10}, \\ P_{32}(t) = (64a_0a_1 + 16a_0a_1n)F_1(5, 0)t^3 + (288a_1^2 + 480a_0a_2 + (768a_1^2)/n + (1152a_0a_2)/n + 24a_1^2n + 48a_0a_2n)F_1(5, 2)t^4 + (1760a_1a_2 + 1440a_0a_3 \\ + (7424a_1a_2)/n + (5376a_0a_3)/n + 96a_1a_2n + 96a_0a_3n + (2880a_1a_2)/(2+n) + (1728a_0a_3)/(2+n) + (12800a_1a_2)/(n(2+n)) \\ + (7680a_0a_3)/(n(2+n)) + (160a_1a_2n)/(2+n) + (96a_0a_3n)/(2+n))F_1(5, 4)t^5 + (2016a_2^2 + 3808a_1a_3 + 3136a_0a_4 + (11520a_2^2)/n + (21120a_1a_3)/n \\ + (15360a_0a_4)/n + 80a_2^2n + 160a_1a_3n + 160a_0a_4n + (8448a_2^2)/(2+n) + (14784a_1a_3)/(2+n) + (8448a_0a_4)/(2+n) + (46080a_2^2)/(n(2+n)) \\ + (80640a_1a_3)/(n(2+n)) + (46080a_0a_4)/(n(2+n)) + (384a_2^2n)/(2+n) + (672a_1a_3n)/(2+n) + (384a_0a_4n)/(2+n))F_1(5, 6)t^6 \\ + (7488a_2a_3 + 6912a_1a_4 + (52992a_2a_3)/n + (46848a_1a_4)/n + 240a_2a_3n + 240a_1a_4n + (54912a_2a_3)/(2+n) + (44928a_1a_4)/(2+n) \\ + (354816a_2a_3)/(n(2+n)) + (290304a_1a_4)/(n(2+n)) + (2112a_2a_3n)/(2+n) + (1728a_1a_4n)/(2+n))F_1(5, 8)t^7 + (6336a_3^2 + 12320a_2a_4 \\ + (53760a_3^2)/n + (103040a_2a_4)/n + 168a_3^2n + 336a_2a_4n + (72000a_3^2)/(2+n) + (134400a_2a_4)/(2+n) + (537600a_3^2)/(n(2+n)) \\ + (1003520a_2a_4)/(n(2+n)) + (2400a_3^2n)/(2+n) + (4480a_2a_4n)/(2+n))F_1(5, 10)t^8 + (19552a_3a_4 + (192000a_3a_4)/n + 448a_3a_4n \\ + (310080a_3a_4)/(2+n) + (2626560a_3a_4)/(n(2+n)) + (9120a_3a_4n)/(2+n))F_1(5, 12)t^9 + (14400a_4^2 + (161280a_4^2)/n + 288a_4^2n \\ + (306432a_4^2)/(2+n) + (2903040a_4^2)/(n(2+n)) + (8064a_4^2n)/(2+n))F_1(5, 14)t^{10}, \\ P_{33}(t) = (1536a_1^2 + 2304a_0a_2 + 576a_1^2n + 960a_0a_2n + 48a_1^2n^2 + 96a_0a_2n^2)F_1(7, 0)t^4 + (55296a_1a_2 + 39936a_0a_3 + (110592a_1a_2)/n + (73728a_0a_3)/n \\ + 8448a_1a_2n + 6912a_0a_3n + 384a_1a_2n^2 + 384a_0a_3n^2)F_1(7, 2)t^5 + (151296a_2^2 + 277248a_1a_3 + 201216a_0a_4 + (460800a_2^2)/n + (829440a_1a_3)/n \\ + (552960a_0a_4)/n + 15552a_2^2n + 29376a_1a_3n + 24192a_0a_4n + 480a_2^2n^2 + 960a_1a_3n^2 + 960a_0a_4n^2 + (227328a_2^2)/(2+n) + (397824a_1a_3)/(2+n) \\ + (227328a_0a_4)/(2+n) + (737280a_2^2)/(n(2+n)) + (1290240a_1a_3)/(n(2+n)) + (737280a_0a_4)/(n(2+n)) + (23040a_2^2n)/(2+n) \\ + (40320a_1a_3n)/(2+n) + (23040a_0a_4n)/(2+n) + (768a_2^2n^2)/(2+n) + (1344a_1a_3n^2)/(2+n) + (768a_0a_4n^2)/(2+n))F_1(7, 4)t^6 \\ + (1003008a_2a_3 + 886272a_1a_4 + (3962880a_2a_3)/n + (3409920a_1a_4)/n + 79872a_2a_3n + 73728a_1a_4n + 1920a_2a_3n^2 + 1920a_1a_4n^2 \\ + (3615744a_2a_3)/(2+n) + (2958336a_1a_4)/(2+n) + (14192640a_2a_3)/(n(2+n)) + (11612160a_1a_4)/(n(2+n)) + (304128a_2a_3n)/(2+n) \\ + (248832a_1a_4n)/(2+n) + (8448a_2a_3n^2)/(2+n) + (6912a_1a_4n^2)/(2+n))F_1(7, 6)t^7 + (1332480a_3^2 + 2553600a_2a_4 + (6451200a_3^2)/n \\ + (12257280a_2a_4)/n + 86400a_3^2n + 168000a_2a_4n + 1680a_3^2n^2 + 3360a_2a_4n^2 + (8409600a_3^2)/(2+n) + (15697920a_2a_4)/(2+n) \\ + (38707200a_3^2)/(n(2+n)) + (72253440a_2a_4)/(n(2+n)) + (604800a_3^2n)/(2+n) + (1128960a_2a_4n)/(2+n) + (14400a_3^2n^2)/(2+n) \\ + (26880a_2a_4n^2)/(2+n))F_1(7, 8)t^8 + (5890560a_3a_4 + (33546240a_3a_4)/n + 324864a_3a_4n + 5376a_3a_4n^2 + (55741440a_3a_4)/(2+n) \\ + (294174720a_3a_4)/(n(2+n)) + (3502080a_3a_4n)/(2+n) + (72960a_3a_4n^2)/(2+n))F_1(7, 10)t^9 + (5902848a_4^2 + (38707200a_4^2)/n + 282240a_4^2n \\ + 4032a_4^2n^2 + (78059520a_4^2)/(2+n) + (464486400a_4^2)/(n(2+n)) + (4354560a_4^2n)/(2+n) + (80640a_4^2n^2)/(2+n))F_1(7, 12)t^{10}, \\ P_{34}(t) = (221184a_1a_2 + 147456a_0a_3 + 110592a_1a_2n + 79872a_0a_3n + 16896a_1a_2n^2 + 13824a_0a_3n^2 + 768a_1a_2n^3 + 768a_0a_3n^3)F_1(9, 0)t^5 \\ + (3962880a_2^2 + 7127040a_1a_3 + 4730880a_0a_4 + (6635520a_2^2)/n + (11796480a_1a_3)/n + (7372800a_0a_4)/n + 821760a_2^2n + 1505280a_1a_3n \\ + 1090560a_0a_4n + 69120a_2^2n^2 + 130560a_1a_3n^2 + 107520a_0a_4n^2 + 1920a_2^2n^3 + 3840a_1a_3n^3 + 3840a_0a_4n^3)F_1(9, 2)t^6 \\ + (62312448a_2a_3 + 53563392a_1a_4 + (151879680a_2a_3)/n + (128286720a_1a_4)/n + 9151488a_2a_3n + 8082432a_1a_4n + 559104a_2a_3n^2 \\ + 516096a_1a_4n^2 + 11520a_2a_3n^3 + 11520a_1a_4n^3 + (86237184a_2a_3)/(2+n) + (70557696a_1a_4)/(2+n) + (227082240a_2a_3)/(n(2+n)) \\ + (185794560a_1a_4)/(n(2+n)) + (12097536a_2a_3n)/(2+n) + (9897984a_1a_4n)/(2+n) + (743424a_2a_3n^2)/(2+n) + (608256a_1a_4n^2)/(2+n) \\ + (16896a_2a_3n^3)/(2+n) + (13824a_1a_4n^3)/(2+n))F_1(9, 4)t^7 + (149207040a_3^2 + 283422720a_2a_4 + (464486400a_3^2)/n + (877363200a_2a_4)/n \\ + 17226240a_3^2n + 33008640a_2a_4n + 829440a_3^2n^2 + 1612800a_2a_4n^2 + 13440a_3^2n^3 + 26880a_2a_4n^3 + (491212800a_3^2)/(2+n)$$

$$\begin{aligned}
& + (916930560a_2a_4)/(2+n) + (1548288000a_3^2)/(n(2+n)) + (2890137600a_2a_4)/(n(2+n)) + (57830400a_3^2n)/(2+n) + (107950080a_2a_4n)/(2+n) \\
& + (2995200a_3^2n^2)/(2+n) + (5591040a_2a_4n^2)/(2+n) + (57600a_3^2n^3)/(2+n) + (107520a_2a_4n^3)/(2+n)F_1(9, 6)t^8 \\
& + (1029672960a_3a_4 + (3860398080a_3a_4)/n + 98903040a_3a_4n + 3970560a_3a_4n^2 + 53760a_3a_4n^3 + (5778432000a_3a_4)/(2+n) \\
& + (21180579840a_3a_4)/(n(2+n)) + (586598400a_3a_4n)/(2+n) + (26265600a_3a_4n^2)/(2+n) + (437760a_3a_4n^3)/(2+n)F_1(9, 8)t^9 + (1485066240a_4^2 \\
& + (6502809600a_4^2)/n + 122121216a_4^2n + 4193280a_4^2n^2 + 48384a_4^2n^3 + (12458557440a_4^2)/(2+n) + (52022476800a_4^2)/(n(2+n)) \\
& + (1112186880a_4^2n)/(2+n) + (43868160a_4^2n^2)/(2+n) + (645120a_4^2n^3)/(2+n)F_1(9, 10)t^{10},
\end{aligned}$$

$$\begin{aligned}
P_{35}(t) = & (13271040a_2^2 + 23592960a_1a_3 + 14745600a_0a_4 + 7925760a_2^2n + 14254080a_1a_3n + 9461760a_0a_4n + 1643520a_2^2n^2 + 3010560a_1a_3n^2 \\
& + 2181120a_0a_4n^2 + 138240a_2^2n^3 + 261120a_1a_3n^3 + 215040a_0a_4n^3 + 3840a_2^2n^4 + 7680a_1a_3n^4 + 7680a_0a_4n^4)F_1(11, 0)t^6 + (1450967040a_2a_3 \\
& + 1223884800a_1a_4 + (2123366400a_0a_2a_3)/n + (1769472000a_1a_4)/n + 370851840a_2a_3n + 318504960a_1a_4n + 44052480a_2a_3n^2 + 38891520a_1a_4n^2 \\
& + 2396160a_2a_3n^3 + 2211840a_1a_4n^3 + 46080a_2a_3n^4 + 46080a_1a_4n^4)F_1(11, 2)t^7 + (8332738560a_3^2 + 15734046720a_2a_4 + (17340825600a_3^2)/n \\
& + (32617267200a_2a_4)/n + 1539993600a_2^2n + 2924544000a_2a_4n + 135244800a_3^2n^2 + 259123200a_2a_4n^2 + 5529600a_3^2n^3 + 10752000a_2a_4n^3 \\
& + 80640a_3^2n^4 + 161280a_2a_4n^4 + (10955980800a_3^2)/(2+n) + (20451164160a_2a_4)/(2+n) + (24772608000a_3^2)/(n(2+n)) \\
& + (46242201600a_2a_4)/(n(2+n)) + (1907712000a_3^2n)/(2+n) + (3561062400a_2a_4n)/(2+n) + (163584000a_3^2n^2)/(2+n) \\
& + (305356800a_2a_4n^2)/(2+n) + (6912000a_3^2n^3)/(2+n) + (12902400a_2a_4n^3)/(2+n) + (115200a_3^2n^4)/(2+n) + (215040a_2a_4n^4)/(2+n)F_1(11, 4)t^8 \\
& + (103421214720a_3a_4 + (270021427200a_3a_4)/n + 15331123200a_3a_4n + 1086873600a_3a_4n^2 + 36096000a_3a_4n^3 + 430080a_3a_4n^4 \\
& + (315859599360a_3a_4)/(2+n) + (847223193600a_3a_4)/(n(2+n)) + (46577664000a_3a_4n)/(2+n) + (3397017600a_3a_4n^2)/(2+n) \\
& + (122572800a_3a_4n^3)/(2+n) + (1751040a_3a_4n^4)/(2+n)F_1(11, 6)t^9 + (233667624960a_4^2 + (728314675200a_4^2)/n + 29069107200a_4^2n \\
& + 1732147200a_4^2n^2 + 48384000a_4^2n^3 + 483840a_4^2n^4 + (1209150996480a_4^2)/(2+n) + (3745618329600a_4^2)/(n(2+n)) \\
& + (154828800000a_4^2n)/(2+n) + (9831628800a_4^2n^2)/(2+n) + (309657600a_4^2n^3)/(2+n) + (3870720a_4^2n^4)/(2+n)F_1(11, 8)t^{10},
\end{aligned}$$

$$\begin{aligned}
P_{36}(t) = & (4246732800a_2a_3 + 3538944000a_1a_4 + 2901934080a_2a_3n + 2447769600a_1a_4n + 741703680a_2a_3n^2 + 637009920a_1a_4n^2 + 88104960a_2a_3n^3 \\
& + 77783040a_1a_4n^3 + 4792320a_2a_3n^4 + 4423680a_1a_4n^4 + 92160a_2a_3n^5 + 92160a_1a_4n^5)F_1(13, 0)t^7 + (179849134080a_3^2 + 338146099200a_2a_4 \\
& + (237817036800a_3^2)/n + (445906944000a_2a_4)/n + 53281751040a_3^2n + 100576788480a_2a_4n + 7896268800a_3^2n^2 + 14992588800a_2a_4n^2 \\
& + 612864000a_3^2n^3 + 1174118400a_2a_4n^3 + 23224320a_3^2n^4 + 45158400a_2a_4n^4 + 322560a_3^2n^5 + 645120a_2a_4n^5)F_1(13, 2)t^8 + (5365676113920a_3a_4 \\
& + (9869407027200a_3a_4)/n + 1174784901120a_3a_4n + 131659776000a_3a_4n^2 + 7877836800a_3a_4n^3 + 233902080a_3a_4n^4 + 2580480a_3a_4n^5 \\
& + (6748199976960a_3a_4)/(2+n) + (13555571097600a_3a_4)/(n(2+n)) + (1376961822720a_3a_4n)/(2+n) + (147507609600a_3a_4n^2)/(2+n) \\
& + (8755200000a_3a_4n^3)/(2+n) + (273162240a_3a_4n^4)/(2+n) + (3502080a_3a_4n^5)/(2+n)F_1(13, 4)t^9 + (21879167385600a_4^2 \\
& + (49941577728000a_4^2)/n + 3883973345280a_4^2n + 355022438400a_4^2n^2 + 17418240000a_4^2n^3 + 4257792000a_4^2n^4 + 3870720a_4^2n^5 \\
& + (63348513177600a_4^2)/(2+n) + (149824733184000a_4^2)/(n(2+n)) + (11029755985920a_4^2n)/(2+n) + (1012580352000a_4^2n^2)/(2+n) \\
& + (51712819200a_4^2n^3)/(2+n) + (1393459200a_4^2n^4)/(2+n) + (15482880a_4^2n^5)/(2+n)F_1(13, 6)t^{10},
\end{aligned}$$

$$\begin{aligned}
P_{37}(t) = & (475634073600a_3^2 + 891813888000a_2a_4 + 359698268160a_3^2n + 676292198400a_2a_4n + 106563502080a_3^2n^2 + 201153576960a_2a_4n^2 \\
& + 15792537600a_3^2n^3 + 29985177600a_2a_4n^3 + 1225728000a_3^2n^4 + 2348236800a_2a_4n^4 + 46448640a_3^2n^5 + 90316800a_2a_4n^5 + 645120a_3^2n^6 \\
& + 1290240a_2a_4n^6)F_1(15, 0)t^8 + (109395836928000a_3a_4 + (133177540608000a_3a_4)/n + 36368830955520a_3a_4n + 6342448250880a_3a_4n^2 \\
& + 624682598400a_3a_4n^3 + 34475212800a_3a_4n^4 + 970260480a_3a_4n^5 + 10321920a_3a_4n^6)F_1(15, 2)t^9 + (1078143536332800a_4^2 \\
& + (1797896798208000a_4^2)/n + 268609388544000a_4^2n + 35874700001280a_4^2n^2 + 2755023667200a_4^2n^3 + 120301977600a_4^2n^4 + 2709504000a_4^2n^5 \\
& + 23224320a_4^2n^6 + (1313225677209600a_4^2)/(2+n) + (2397195730944000a_4^2)/(n(2+n)) + (303173122129920a_4^2n)/(2+n) \\
& + (38260797603840a_4^2n^2)/(2+n) + (2852565811200a_4^2n^3)/(2+n) + (125720985600a_4^2n^4)/(2+n) + (3034644480a_4^2n^5)/(2+n) \\
& + (30965760a_4^2n^6)/(2+n)F_1(15, 4)t^{10},
\end{aligned}$$

$$\begin{aligned}
P_{38}(t) = & (266355081216000a_3a_4 + 218791673856000a_3a_4n + 72737661911040a_3a_4n^2 + 12684896501760a_3a_4n^3 + 1249365196800a_3a_4n^4 \\
& + 68950425600a_3a_4n^5 + 1940520960a_3a_4n^6 + 20643840a_3a_4n^7)F_1(17, 0)t^9 + (21069638192332800a_4^2 + (23971957309440000a_4^2)/n \\
& + 7674141742202880a_4^2n + 1514478344601600a_4^2n^2 + 176949252587520a_4^2n^3 + 12485394432000a_4^2n^4 + 515022520320a_4^2n^5 \\
& + 11147673600a_4^2n^6 + 92897280a_4^2n^7)F_1(17, 2)t^{10},
\end{aligned}$$

$$\begin{aligned}
P_{39}(t) = & (47943914618880000a_4^2 + 421392763846656000a_4^2n + 15348283484405760a_4^2n^2 + 3028956689203200a_4^2n^3 + 353898505175040a_4^2n^4 \\
& + 24970788864000a_4^2n^5 + 1030045040640a_4^2n^6 + 22295347200a_4^2n^7 + 185794560a_4^2n^8)F_1(19, 0)t^{10}.
\end{aligned}$$

Also we set P_{21}, \dots, P_{29} and $P_{2(10)}$ by substituting each $F_1(\alpha, \beta)$ appearing in $P_1, P_{31}, \dots, P_{38}$ and P_{39} by $F_4(\alpha + 2, \beta)$. Then the polynomial P defined by (4.31) satisfies (4.32).

The next lemma is an extension of Proposition 4.14 in [1].

Lemma 4.2. *Define*

$$\begin{aligned}
\bar{P}_{1;0}(t) = & 1/(2n(n+2)) \cdot (a_4^2F_2(1, 18)t^9 + 2a_3a_4F_2(1, 16)t^8 + (a_3^2 + 2a_2a_4)F_2(1, 14)t^7 + (2a_2a_3 + 2a_1a_4)F_2(1, 12)t^6 + (a_2^2 + 2a_1a_3 + 2a_0a_4)F_2(1, 10)t^5 \\
& + (2a_1a_2 + 2a_0a_3)F_2(1, 8)t^4 + (a_1^2 + 2a_0a_2)F_2(1, 6)t^3 + 2a_0a_1F_2(1, 4)t^2 + a_0^2F_2(1, 2)t), \\
\bar{P}_{1;1}(t) = & 2a_0^2F_1(1, 0)t + (4a_0a_1 + (32a_0a_1)/n)F_1(1, 2)t^2 + (2a_1^2 + 4a_0a_2 + (40a_1^2)/n + (64a_0a_2)/n + (112a_1^2)/(n(2+n)) + (160a_0a_2)/(n(2+n)))F_1(1, 4)t^3 \\
& + (4a_1a_2 + 4a_0a_3 + (128a_1a_2)/n + (96a_0a_3)/n + (736a_1a_2)/(n(2+n)) + (480a_0a_3)/(n(2+n)) + (640a_1a_2)/(n(2+n)(4+n)))
\end{aligned}$$

$$\begin{aligned}
& + (384a_0a_3)/(n(2+n)(4+n))F_1(1, 6)r^4 + (2a_2^2 + 4a_1a_3 + 4a_0a_4 + (96a_2^2)/n + (176a_1a_3)/n + (128a_0a_4)/n + (864a_2^2)/(n(2+n))) \\
& + (1536a_1a_3)/(n(2+n)) + (960a_0a_4)/(n(2+n)) + (1536a_2^2)/(n(2+n)(4+n)) + (2688a_1a_3)/(n(2+n)(4+n)) \\
& + (1536a_0a_4)/(n(2+n)(4+n))F_1(1, 8)r^5 + (4a_2a_3 + 4a_1a_4 + (256a_2a_3)/n + (224a_1a_4)/n + (3136a_2a_3)/(n(2+n)) + (2624a_1a_4)/(n(2+n))) \\
& + (8448a_2a_3)/(n(2+n)(4+n)) + (6912a_1a_4)/(n(2+n)(4+n))F_1(1, 10)r^6 + (2a_3^2 + 4a_2a_4 + (168a_3^2)/n + (320a_2a_4)/n + (2640a_3^2)/(n(2+n))) \\
& + (4960a_2a_4)/(n(2+n)) + (9600a_3^2)/(n(2+n)(4+n)) + (17920a_2a_4)/(n(2+n)(4+n))F_1(1, 12)r^7 + (4a_3a_4 + (416a_3a_4)/n \\
& + (7968a_3a_4)/(n(2+n)) + (36480a_3a_4)/(n(2+n)(4+n))F_1(1, 14)r^8 + (2a_4^2 + (256a_4^2)/n + (5824a_4^2)/(n(2+n))) \\
& + (32256a_4^2)/(n(2+n)(4+n))F_1(1, 16)r^9,
\end{aligned}$$

$$\begin{aligned}
\bar{P}_{1;31}(t) = & (64a_0a_1 + 8a_0a_1n)F_1(3, 0)r^2 + (176a_1^2 + 288a_0a_2 + (768a_1^2)/n + (1152a_0a_2)/n + 8a_1^2n + 16a_0a_2n)F_1(3, 2)r^3 + (864a_1a_2 + 672a_0a_3 \\
& + (6016a_1a_2)/n + (4224a_0a_3)/n + 24a_1a_2n + 24a_0a_3n + (1472a_1a_2)/(2+n) + (960a_0a_3)/(2+n) + (15616a_1a_2)/(n(2+n))) \\
& + (9984a_0a_3)/(n(2+n))F_1(3, 4)r^4 + (864a_2^2 + 1600a_1a_3 + 1216a_0a_4 + (8064a_2^2)/n + (14592a_1a_3)/n + (9984a_0a_4)/n + 16a_2^2n + 32a_1a_3n \\
& + 32a_0a_4n + (3456a_2^2)/(2+n) + (6144a_1a_3)/(2+n) + (3840a_0a_4)/(2+n) + (43776a_2^2)/(n(2+n)) + (77568a_1a_3)/(n(2+n))) \\
& + (47616a_0a_4)/(n(2+n)) + (3072a_2^2)/((2+n)(4+n)) + (5376a_1a_3)/((2+n)(4+n)) + (3072a_0a_4)/((2+n)(4+n)) + (36864a_2^2)/(n(2+n)(4+n)) \\
& + (64512a_1a_3)/(n(2+n)(4+n)) + (36864a_0a_4)/(n(2+n)(4+n))F_1(3, 6)r^5 + (2880a_2a_3 + 2560a_1a_4 + (33024a_2a_3)/n + (28416a_1a_4)/n \\
& + 40a_2a_3n + 40a_1a_4n + (18816a_2a_3)/(2+n) + (15744a_1a_4)/(2+n) + (276480a_2a_3)/(n(2+n)) + (230400a_1a_4)/(n(2+n))) \\
& + (33792a_2a_3)/((2+n)(4+n)) + (27648a_1a_4)/((2+n)(4+n)) + (473088a_2a_3)/(n(2+n)(4+n)) + (387072a_1a_4)/(n(2+n)(4+n))F_1(3, 8)r^6 \\
& + (2256a_3^2 + 4320a_2a_4 + (30720a_3^2)/n + (58240a_2a_4)/n + 24a_3^2n + 48a_2a_4n + (21120a_3^2)/(2+n) + (39680a_2a_4)/(2+n) + (353280a_3^2)/(n(2+n))) \\
& + (663040a_2a_4)/(n(2+n)) + (57600a_3^2)/((2+n)(4+n)) + (107520a_2a_4)/((2+n)(4+n)) + (921600a_3^2)/(n(2+n)(4+n)) \\
& + (1720320a_2a_4)/(n(2+n)(4+n))F_1(3, 10)r^7 + (6496a_3a_4 + (101760a_3a_4)/n + 56a_3a_4n + (79680a_3a_4)/(2+n) + (1493760a_3a_4)/(n(2+n))) \\
& + (291840a_3a_4)/((2+n)(4+n)) + (5253120a_3a_4)/(n(2+n)(4+n))F_1(3, 12)r^8 + (4544a_4^2 + (80640a_4^2)/n + 32a_4^2n + (69888a_4^2)/(2+n) \\
& + (1451520a_4^2)/(n(2+n)) + (322560a_4^2)/((2+n)(4+n)) + (6451200a_4^2)/(n(2+n)(4+n))F_1(3, 14)r^9,
\end{aligned}$$

$$\begin{aligned}
\bar{P}_{1;32}(t) = & (1536a_1^2 + 2304a_0a_2 + 352a_1^2n + 576a_0a_2n + 16a_1^2n^2 + 32a_0a_2n^2)F_1(5, 0)r^3 + (36864a_1a_2 + 26112a_0a_3 + (110592a_1a_2)/n + (73728a_0a_3)/n \\
& + 3648a_1a_2n + 2880a_0a_3n + 96a_1a_2n^2 + 96a_0a_3n^2)F_1(5, 2)r^4 + (82944a_2^2 + 150528a_1a_3 + 104448a_0a_4 + (368640a_2^2)/n + (660480a_1a_3)/n \\
& + (430080a_0a_4)/n + 5568a_2^2n + 10368a_1a_3n + 8064a_0a_4n + 96a_2^2n^2 + 192a_1a_3n^2 + 192a_0a_4n^2 + (161280a_2^2)/(2+n) + (285696a_1a_3)/(2+n) \\
& + (175104a_0a_4)/(2+n) + (921600a_2^2)/(n(2+n)) + (1628160a_1a_3)/(n(2+n)) + (983040a_0a_4)/(n(2+n)) + (6912a_2^2n)/(2+n) \\
& + (12288a_1a_3n)/(2+n) + (7680a_0a_4n)/(2+n))F_1(5, 4)r^5 + (477696a_2a_3 + 413184a_1a_4 + (2691072a_2a_3)/n + (2285568a_1a_4)/n \\
& + 24960a_2a_3n + 22400a_1a_4n + 320a_2a_3n^2 + 320a_1a_4n^2 + (2061312a_2a_3)/(2+n) + (1717248a_1a_4)/(2+n) + (13897728a_2a_3)/(n(2+n)) \\
& + (11538432a_1a_4)/(n(2+n)) + (75264a_2a_3n)/(2+n) + (62976a_1a_4n)/(2+n) + (1757184a_2a_3)/((2+n)(4+n)) + (1437696a_1a_4)/((2+n)(4+n)) \\
& + (11354112a_2a_3)/(n(2+n)(4+n)) + (9289728a_1a_4)/(n(2+n)(4+n)) + (67584a_2a_3n)/((2+n)(4+n)) \\
& + (55296a_1a_4n)/((2+n)(4+n))F_1(5, 6)r^6 + (572160a_3^2 + 1086720a_2a_4 + (3870720a_3^2)/n + (7311360a_2a_4)/n + 24480a_3^2n + 47040a_2a_4n \\
& + 240a_3^2n^2 + 480a_2a_4n^2 + (3985920a_3^2)/(2+n) + (7480320a_2a_4)/(2+n) + (30965760a_3^2)/(n(2+n)) + (58060800a_2a_4)/(n(2+n)) \\
& + (126720a_3^2n)/(2+n) + (238080a_2a_4n)/(2+n) + (6912000a_3^2)/((2+n)(4+n)) + (12902400a_2a_4)/((2+n)(4+n)) \\
& + (51609600a_3^2)/(n(2+n)(4+n)) + (96337920a_2a_4)/(n(2+n)(4+n)) + (230400a_3^2n)/((2+n)(4+n)) \\
& + (430080a_2a_4n)/((2+n)(4+n))F_1(5, 8)r^7 + (2319360a_3a_4 + (18186240a_3a_4)/n + 84672a_3a_4n + 672a_3a_4n^2 + (22625280a_3a_4)/(2+n) \\
& + (198819840a_3a_4)/(n(2+n)) + (637440a_3a_4n)/(2+n) + (59535360a_3a_4)/((2+n)(4+n)) + (504299520a_3a_4)/(n(2+n)(4+n)) \\
& + (1751040a_3a_4n)/((2+n)(4+n))F_1(5, 10)r^8 + (2171904a_4^2 + (19353600a_4^2)/n + 68992a_4^2n + 448a_4^2n^2 + (27632640a_4^2)/(2+n) \\
& + (270950400a_4^2)/(n(2+n)) + (698880a_4^2n)/(2+n) + (98058240a_4^2)/((2+n)(4+n)) + (928972800a_4^2)/(n(2+n)(4+n)) \\
& + (2580480a_4^2n)/((2+n)(4+n))F_1(5, 12)r^9,
\end{aligned}$$

$$\begin{aligned}
\bar{P}_{1;33}(t) = & (221184a_1a_2 + 147456a_0a_3 + 73728a_1a_2n + 52224a_0a_3n + 7296a_1a_2n^2 + 5760a_0a_3n^2 + 192a_1a_2n^3 + 192a_0a_3n^3)F_1(7, 0)r^4 + (2783232a_2^2 \\
& + 4988928a_1a_3 + 3256320a_0a_4 + (6635520a_2^2)/n + (11796480a_1a_3)/n + (7372800a_0a_4)/n + 403968a_2^2n + 734208a_1a_3n + 513024a_0a_4n \\
& + 23040a_2^2n^2 + 43008a_1a_3n^2 + 33792a_0a_4n^2 + 384a_2^2n^3 + 768a_1a_3n^3 + 768a_0a_4n^3)F_1(7, 2)r^5 + (35856384a_2a_3 + 30498816a_1a_4 \\
& + (120176640a_2a_3)/n + (101007360a_1a_4)/n + 3766272a_2a_3n + 3268608a_1a_4n + 157440a_2a_3n^2 + 142080a_1a_4n^2 + 1920a_2a_3n^3 + 1920a_1a_4n^3 \\
& + (71319552a_2a_3)/(2+n) + (59179008a_1a_4)/(2+n) + (290488320a_2a_3)/(n(2+n)) + (240353280a_1a_4)/(n(2+n)) + (5732352a_2a_3n)/(2+n) \\
& + (4773888a_1a_4n)/(2+n) + (150528a_2a_3n^2)/(2+n) + (125952a_1a_4n^2)/(2+n))F_1(7, 4)r^6 + (74373120a_3^2 + 140574720a_2a_4 + (309657600a_3^2)/n \\
& + (583188480a_2a_4)/n + 6259200a_3^2n + 11904000a_2a_4n + 207360a_3^2n^2 + 399360a_2a_4n^2 + 1920a_3^2n^3 + 3840a_2a_4n^3 + (324771840a_3^2)/(2+n) \\
& + (608870400a_2a_4)/(2+n) + (1548288000a_3^2)/(n(2+n)) + (2900459520a_2a_4)/(n(2+n)) + (22394880a_3^2n)/(2+n) + (42024960a_2a_4n)/(2+n) \\
& + (506880a_3^2n^2)/(2+n) + (952320a_2a_4n^2)/(2+n) + (269107200a_3^2)/((2+n)(4+n)) + (502333440a_2a_4)/((2+n)(4+n)) \\
& + (1238630400a_3^2)/(n(2+n)(4+n)) + (2312110080a_2a_4)/(n(2+n)(4+n)) + (19353600a_3^2n)/((2+n)(4+n)) \\
& + (36126720a_2a_4n)/((2+n)(4+n)) + (460800a_3^2n^2)/((2+n)(4+n)) + (860160a_2a_4n^2)/((2+n)(4+n))F_1(7, 6)r^7 + (457912320a_3a_4 \\
& + (2250178560a_3a_4)/n + 32517120a_3a_4n + 900480a_3a_4n^2 + 6720a_3a_4n^3 + (3179151360a_3a_4)/(2+n) + (17340825600a_3a_4)/(n(2+n)) \\
& + (192153600a_3a_4n)/(2+n) + (3824640a_3a_4n^2)/(2+n) + (5351178240a_3a_4)/((2+n)(4+n)) + (28240773120a_3a_4)/(n(2+n)(4+n)) \\
& + (336199680a_3a_4n)/((2+n)(4+n)) + (7004160a_3a_4n^2)/((2+n)(4+n))F_1(7, 8)r^8 + (603402240a_4^2 + (3406233600a_4^2)/n + 37137408a_4^2n \\
& + 881664a_4^2n^2 + 5376a_4^2n^3 + (5850808320a_4^2)/(2+n) + (35920281600a_4^2)/(n(2+n)) + (314818560a_4^2n)/(2+n) + (5591040a_4^2n^2)/(2+n)
\end{aligned}$$

$$+ (14987427840a_4^2)/((2+n)(4+n)) + (89181388800a_4^2)/(n(2+n)(4+n)) + (836075520a_4^2n)/((2+n)(4+n)) \\ + (15482880a_4^2n^2)/((2+n)(4+n))F_1(7, 10)t^9,$$

$$\begin{aligned} \bar{P}_{1;34}(t) = & (13271040a_2^2 + 23592960a_1a_3 + 14745600a_0a_4 + 5566464a_2^2n + 9977856a_1a_3n + 6512640a_0a_4n + 807936a_2^2n^2 + 1468416a_1a_3n^2 \\ & + 1026048a_0a_4n^2 + 46080a_2^2n^3 + 86016a_1a_3n^3 + 67584a_0a_4n^3 + 768a_2^2n^4 + 1536a_1a_3n^4 + 1536a_0a_4n^4)F_1(9, 0)t^5 + (1052835840a_2a_3 \\ & + 884736000a_1a_4 + (2123366400a_2a_3)/n + (1769472000a_1a_4)/n + 196485120a_2a_3n + 167239680a_1a_4n + 16926720a_2a_3n^2 \\ & + 14714880a_1a_4n^2 + 645120a_2a_3n^3 + 583680a_1a_4n^3 + 7680a_2a_3n^4 + 7680a_1a_4n^4)F_1(9, 2)t^6 + (4941987840a_3^2 + 9308405760a_2a_4 \\ & + (13624934400a_3^2)/n + (25598361600a_2a_4)/n + 686039040a_3^2n + 1297244160a_2a_4n + 44559360a_3^2n^2 + 84817920a_2a_4n^2 + 1290240a_3^2n^3 \\ & + 2488320a_2a_4n^3 + 11520a_3^2n^4 + 23040a_2a_4n^4 + (9907568640a_3^2)/(2+n) + (18556846080a_2a_4)/(2+n) + (32204390400a_3^2)/(n(2+n)) \\ & + (60280012800a_2a_4)/(n(2+n)) + (1123983360a_3^2)/(2+n) + (2106900480a_2a_4)/(2+n) + (55664640a_3^2n^2)/(2+n) \\ & + (104448000a_2a_4n^2)/(2+n) + (1013760a_3^2n^3)/(2+n) + (1904640a_2a_4n^3)/(2+n)F_1(9, 4)t^7 + (52697825280a_3a_4 + (177371873280a_3a_4)/n \\ & + 5992734720a_3a_4n + 318658560a_3a_4n^2 + 7526400a_3a_4n^3 + 53760a_3a_4n^4 + (228636426240a_3a_4)/(2+n) + (863077662720a_3a_4)/(n(2+n)) \\ & + (22419947520a_3a_4n)/(2+n) + (963624960a_3a_4n^2)/(2+n) + (15298560a_3a_4n^3)/(2+n) + (184909824000a_3a_4)/((2+n)(4+n)) \\ & + (677778554880a_3a_4)/(n(2+n)(4+n)) + (18771148800a_3a_4n)/((2+n)(4+n)) + (840499200a_3a_4n^2)/((2+n)(4+n)) \\ & + (14008320a_3a_4n^3)/((2+n)(4+n))F_1(9, 6)t^8 + (105737748480a_4^2 + (416179814400a_4^2)/n + 10264289280a_4^2n + 464271360a_4^2n^2 \\ & + 9246720a_4^2n^3 + 53760a_4^2n^4 + (726704455680a_4^2)/(2+n) + (3121348608000a_4^2)/(n(2+n)) + (62788239360a_4^2n)/(2+n) \\ & + (2384363520a_4^2n^2)/(2+n) + (33546240a_4^2n^3)/(2+n) + (1196021514240a_4^2)/((2+n)(4+n)) + (4994157772800a_4^2)/(n(2+n)(4+n)) \\ & + (106769940480a_4^2n)/((2+n)(4+n)) + (4211343360a_4^2n^2)/((2+n)(4+n)) + (61931520a_4^2n^3)/((2+n)(4+n))F_1(9, 8)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{1;35}(t) = & (4246732800a_2a_3 + 3538944000a_1a_4 + 2105671680a_2a_3n + 1769472000a_1a_4n + 392970240a_2a_3n^2 + 334479360a_1a_4n^2 + 33853440a_2a_3n^3 \\ & + 29429760a_1a_4n^3 + 1290240a_2a_3n^4 + 1167360a_1a_4n^4 + 15360a_2a_3n^5 + 15360a_1a_4n^5)F_1(11, 0)t^6 + (133665914880a_3^2 + 251088076800a_2a_4 \\ & + (237817036800a_3^2)/n + (445906944000a_2a_4)/n + 29752197120a_3^2n + 56039178240a_2a_4n + 3323289600a_3^2n^2 + 6285312000a_2a_4n^2 \\ & + 192614400a_3^2n^3 + 366796800a_2a_4n^3 + 5253120a_3^2n^4 + 10137600a_2a_4n^4 + 46080a_3^2n^5 + 92160a_2a_4n^5)F_1(11, 2)t^7 + (3243524751360a_3a_4 \\ & + (7709235609600a_3a_4)/n + 549692375040a_3a_4n + 47458713600a_3a_4n^2 + 2153779200a_3a_4n^3 + 46448640a_3a_4n^4 + 322560a_3a_4n^5 \\ & + (6493797089280a_3a_4)/(2+n) + (17875913932800a_3a_4)/n(2+n) + (928618905600a_3a_4n)/(2+n) + (65300889600a_3a_4n^2)/(2+n) \\ & + (2256076800a_3a_4n^3)/(2+n) + (30597120a_3a_4n^4)/(2+n)F_1(11, 4)t^8 + (11311668264960a_4^2 + (32462025523200a_4^2)/n + 1589740830720a_4^2n \\ & + 113936793600a_4^2n^2 + 4292198400a_4^2n^3 + 76554240a_4^2n^4 + 430080a_4^2n^5 + (48729701744640a_4^2)/(2+n) + (154818890956800a_4^2)/(n(2+n)) \\ & + (6058967040000a_4^2n)/(2+n) + (371795558400a_4^2n^2)/(2+n) + (11250892800a_4^2n^3)/(2+n) + (134184960a_4^2n^4)/(2+n) \\ & + (38692831887360a_4^2)/((2+n)(4+n)) + (119859786547200a_4^2)/n(2+n)(4+n) + (4954521600000a_4^2n)/((2+n)(4+n)) \\ & + (314612121600a_4^2n^2)/((2+n)(4+n)) + (9909043200a_4^2n^3)/((2+n)(4+n)) + (123863040a_4^2n^4)/((2+n)(4+n))F_1(11, 6)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{1;36}(t) = & (475634073600a_3^2 + 891813888000a_2a_4 + 267331829760a_3^2n + 502176153600a_2a_4n + 59504394240a_3^2n^2 + 112078356480a_2a_4n^2 \\ & + 6646579200a_3^2n^3 + 12570624000a_2a_4n^3 + 385228800a_3^2n^4 + 733593600a_2a_4n^4 + 10506240a_3^2n^5 + 20275200a_2a_4n^5 + 92160a_3^2n^6 \\ & + 184320a_2a_4n^6)F_1(13, 0)t^7 + (82760328806400a_3a_4 + (133177540608000a_3a_4)/n + 21086113628160a_3a_4n + 2839642767360a_3a_4n^2 \\ & + 216089395200a_3a_4n^3 + 9109094400a_3a_4n^4 + 188375040a_3a_4n^5 + 1290240a_3a_4n^6)F_1(13, 2)t^8 + (661170998476800a_4^2 \\ & + (1398364176384000a_4^2)/n + 130259657687040a_4^2n + 13760110264320a_4^2n^2 + 831637094400a_4^2n^3 + 28127232000a_4^2n^4 + 469647360a_4^2n^5 \\ & + 2580480a_4^2n^6 + (1321470001152000a_4^2)/(2+n) + (3196260974592000a_4^2)/n(2+n) + (224130005729280a_4^2n)/(2+n) \\ & + (19954335744000a_4^2n^2)/(2+n) + (983059660800a_4^2n^3)/(2+n) + (25391923200a_4^2n^4)/(2+n) + (268369920a_4^2n^5)/(2+n)F_1(13, 4)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{1;37}(t) = & (266355081216000a_3a_4 + 165520657612800a_3a_4n + 42172227256320a_3a_4n^2 + 5679285534720a_3a_4n^3 + 432178790400a_3a_4n^4 \\ & + 18218188800a_3a_4n^5 + 376750080a_3a_4n^6 + 2580480a_3a_4n^7)F_1(15, 0)t^8 + (16168704697958400a_4^2 + (23971957309440000a_4^2)/n \\ & + 4583281278320640a_4^2n + 710936855838720a_4^2n^2 + 65625776455680a_4^2n^3 + 3653133926400a_4^2n^4 + 117339586560a_4^2n^5 + 1899233280a_4^2n^6 \\ & + 10321920a_4^2n^7)F_1(15, 2)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{1;38}(t) = & (47943914618880000a_4^2 + 32337409395916800a_4^2n + 9166562556641280a_4^2n^2 + 1421873711677440a_4^2n^3 + 131251552911360a_4^2n^4 \\ & + 7306267852800a_4^2n^5 + 234679173120a_4^2n^6 + 3798466560a_4^2n^7 + 20643840a_4^2n^8)F_1(17, 0)t^9, \end{aligned}$$

$$\bar{P}_{2;0}(t) = 0,$$

$$\begin{aligned} \bar{P}_{2;1}(t) = & (4a_0a_1)/n \cdot F_1(1, 2)t^2 + ((4a_1^2)/n + (8a_0a_2)/n + (20a_1^2)/n(2+n) + (32a_0a_2)/n(2+n))F_1(1, 4)t^3 + ((12a_1a_2)/n + (12a_0a_3)/n \\ & + (128a_1a_2)/n(2+n) + (96a_0a_3)/n(2+n) + (160a_1a_2)/n(2+n)(4+n) + (96a_0a_3)/n(2+n)(4+n))F_1(1, 6)t^4 + ((8a_2^2)/n + (16a_1a_3)/n \\ & + (16a_0a_4)/n + (144a_2^2)/n(2+n) + (264a_1a_3)/n(2+n) + (192a_0a_4)/n(2+n) + (384a_2^2)/n(2+n)(4+n) + (672a_1a_3)/n(2+n)(4+n) \\ & + (384a_0a_4)/n(2+n)(4+n))F_1(1, 8)t^5 + ((20a_2a_3)/n + (20a_1a_4)/n + (512a_2a_3)/n(2+n) + (448a_1a_4)/n(2+n) \\ & + (2112a_2a_3)/n(2+n)(4+n) + (1728a_1a_4)/n(2+n)(4+n))F_1(1, 10)t^6 + ((12a_3^2)/n + (24a_2a_4)/n + (420a_3^2)/n(2+n) \\ & + (800a_2a_4)/n(2+n) + (2400a_3^2)/n(2+n)(4+n) + (4480a_2a_4)/n(2+n)(4+n))F_1(1, 12)t^7 + ((28a_3a_4)/n + (1248a_3a_4)/n(2+n) \\ & + (9120a_3a_4)/n(2+n)(4+n))F_1(1, 14)t^8 + ((16a_4^2)/n + (896a_4^2)/n(2+n) + (8064a_4^2)/n(2+n)(4+n))F_1(1, 16)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{2;31}(t) = & 8a_0a_1F_1(3, 0)t^2 + (16a_1^2 + 32a_0a_2 + (112a_1^2)/n + (192a_0a_2)/n)F_1(3, 2)t^3 + (72a_1a_2 + 72a_0a_3 + (800a_1a_2)/n + (672a_0a_3)/n \\ & + (256a_1a_2)/(2+n) + (192a_0a_3)/(2+n) + (3008a_1a_2)/n(2+n) + (2112a_0a_3)/n(2+n))F_1(3, 4)t^4 + (64a_2^2 + 128a_1a_3 + 128a_0a_4 \end{aligned}$$

$$\begin{aligned}
& + (960a_2^2)/n + (1824a_1a_3)/n + (1536a_0a_4)/n + (576a_2^2)/(2+n) + (1056a_1a_3)/(2+n) + (768a_0a_4)/(2+n) + (8064a_2^2)/(n(2+n)) \\
& + (14592a_1a_3)/(n(2+n)) + (9984a_0a_4)/(n(2+n)) + (768a_2^2)/((2+n)(4+n)) + (1344a_1a_3)/((2+n)(4+n)) + (768a_0a_4)/((2+n)(4+n)) \\
& + (9216a_2^2)/(n(2+n)(4+n)) + (16128a_1a_3)/(n(2+n)(4+n)) + (9216a_0a_4)/(n(2+n)(4+n)) F_1(3, 6)t^5 + (200a_2a_3 + 200a_1a_4 + (3648a_2a_3)/n \\
& + (3392a_1a_4)/n + (3072a_2a_3)/(2+n) + (2688a_1a_4)/(2+n) + (49536a_2a_3)/(n(2+n)) + (42624a_1a_4)/(n(2+n)) + (8448a_2a_3)/((2+n)(4+n)) \\
& + (6912a_1a_4)/((2+n)(4+n)) + (118272a_2a_3)/(n(2+n)(4+n)) + (96768a_1a_4)/(n(2+n)(4+n)) F_1(3, 8)t^6 + (144a_3^2 + 288a_2a_4 + (3120a_3^2)/n \\
& + (6080a_2a_4)/n + (3360a_3^2)/(2+n) + (6400a_2a_4)/(2+n) + (61440a_3^2)/(n(2+n)) + (116480a_2a_4)/(n(2+n)) + (14400a_3^2)/((2+n)(4+n)) \\
& + (26880a_2a_4)/((2+n)(4+n)) + (230400a_3^2)/(n(2+n)(4+n)) + (430080a_2a_4)/(n(2+n)(4+n)) F_1(3, 10)t^7 + (392a_3a_4 + (9696a_3a_4)/n \\
& + (12480a_3a_4)/(2+n) + (254400a_3a_4)/(n(2+n)) + (72960a_3a_4)/((2+n)(4+n)) + (1313280a_3a_4)/(n(2+n)(4+n)) F_1(3, 12)t^8 + (256a_4^2 \\
& + (7168a_4^2)/n + (10752a_4^2)/(2+n) + (241920a_4^2)/(n(2+n)) + (80640a_4^2)/((2+n)(4+n)) + (1612800a_4^2)/(n(2+n)(4+n)) F_1(3, 14)t^9, \\
\bar{P}_{2,32}(t) = & (208a_1^2 + 352a_0a_2 + 32a_1^2n + 64a_0a_2n)F_1(5, 0)t^3 + (4704a_1a_2 + 3936a_0a_3 + (18432a_1a_2)/n + (13824a_0a_3)/n + 288a_1a_2n \\
& + 288a_0a_3n)F_1(5, 2)t^4 + (9504a_2^2 + 18048a_1a_3 + 15168a_0a_4 + (55296a_2^2)/n + (102144a_1a_3)/n + (76800a_0a_4)/n + 384a_2^2n + 768a_1a_3n \\
& + 768a_0a_4n + (29952a_2^2)/(2+n) + (54144a_1a_3)/(2+n) + (36864a_0a_4)/(2+n) + (184320a_2^2)/(n(2+n)) + (330240a_1a_3)/(n(2+n)) \\
& + (215040a_0a_4)/(n(2+n)) + (1152a_2^2n)/(2+n) + (2112a_1a_3n)/(2+n) + (1536a_0a_4n)/(2+n) F_1(5, 4)t^5 + (50752a_2a_3 + 47168a_1a_4 \\
& + (373248a_2a_3)/n + (333312a_1a_4)/n + 1600a_2a_3n + 1600a_1a_4n + (371712a_2a_3)/(2+n) + (319488a_1a_4)/(2+n) + (2691072a_2a_3)/(n(2+n)) \\
& + (2285568a_1a_4)/(n(2+n)) + (12288a_2a_3n)/(2+n) + (10752a_1a_4n)/(2+n) + (439296a_2a_3)/((2+n)(4+n)) + (359424a_1a_4)/((2+n)(4+n)) \\
& + (2838528a_2a_3)/(n(2+n)(4+n)) + (2322432a_1a_4)/(n(2+n)(4+n)) + (16896a_2a_3n)/((2+n)(4+n)) \\
& + (13824a_1a_4n)/((2+n)(4+n)) F_1(5, 6)t^6 + (55920a_3^2 + 108960a_2a_4 + (495360a_3^2)/n + (952320a_2a_4)/n + 1440a_3^2n + 2880a_2a_4n \\
& + (696960a_3^2)/(2+n) + (1320960a_2a_4)/(2+n) + (5806080a_3^2)/(n(2+n)) + (10967040a_2a_4)/(n(2+n)) + (20160a_3^2n)/(2+n) \\
& + (38400a_2a_4n)/(2+n) + (1728000a_3^2)/((2+n)(4+n)) + (3225600a_2a_4)/((2+n)(4+n)) + (12902400a_3^2)/(n(2+n)(4+n)) \\
& + (24084480a_2a_4)/(n(2+n)(4+n)) + (57600a_3^2n)/((2+n)(4+n)) + (107520a_2a_4n)/((2+n)(4+n)) F_1(5, 8)t^7 + (212640a_3a_4 \\
& + (2181120a_3a_4)/n + 4704a_3a_4n + (3870720a_3a_4)/(2+n) + (36372480a_3a_4)/(n(2+n)) + (99840a_3a_4n)/(2+n) \\
& + (14883840a_3a_4)/((2+n)(4+n)) + (126074880a_3a_4)/(n(2+n)(4+n)) + (437760a_3a_4n)/((2+n)(4+n)) F_1(5, 10)t^8 + (185920a_4^2 \\
& + (2171904a_4^2)/n + 3584a_4^2n + (4623360a_4^2)/(2+n) + (48384000a_4^2)/(n(2+n)) + (107520a_4^2n)/(2+n) + (24514560a_4^2)/((2+n)(4+n)) \\
& + (232243200a_4^2)/(n(2+n)(4+n)) + (645120a_4^2n)/((2+n)(4+n)) F_1(5, 12)t^9, \\
\bar{P}_{2,33}(t) = & (33280a_1a_2 + 24576a_0a_3 + 9024a_1a_2n + 7488a_0a_3n + 576a_1a_2n^2 + 576a_0a_3n^2)F_1(7, 0)t^4 + (407808a_2^2 + 751872a_1a_3 + 560640a_0a_4 \\
& + (1179648a_2^2)/n + (2138112a_1a_3)/n + (1474560a_0a_4)/n + 44928a_2^2n + 85248a_1a_3n + 71424a_0a_4n + 1536a_2^2n^2 + 3072a_1a_3n^2 \\
& + 3072a_0a_4n^2)F_1(7, 2)t^5 + (4889088a_2a_3 + 4357632a_1a_4 + (19722240a_2a_3)/n + (17141760a_1a_4)/n + 388224a_2a_3n + 360576a_1a_4n \\
& + 9600a_2a_3n^2 + 9600a_1a_4n^2 + (13965312a_2a_3)/(2+n) + (11839488a_1a_4)/(2+n) + (60088320a_2a_3)/(n(2+n)) + (50503680a_1a_4)/(n(2+n)) \\
& + (1041408a_2a_3n)/(2+n) + (893952a_1a_4n)/(2+n) + (24576a_2a_3n^2)/(2+n) + (21504a_1a_4n^2)/(2+n) F_1(7, 4)t^6 + (9369600a_3^2 \\
& + 18004480a_2a_4 + (47001600a_3^2)/n + (89579520a_2a_4)/n + 593280a_3^2n + 1155840a_2a_4n + 11520a_3^2n^2 + 23040a_2a_4n^2 + (61470720a_3^2)/(2+n) \\
& + (116060160a_2a_4)/(2+n) + (309657600a_3^2)/(n(2+n)) + (583188480a_2a_4)/(n(2+n)) + (3939840a_3^2n)/(2+n) + (7464960a_2a_4n)/(2+n) \\
& + (80640a_3^2n^2)/(2+n) + (153600a_2a_4n^2)/(2+n) + (67276800a_3^2)/((2+n)(4+n)) + (125583360a_2a_4)/((2+n)(4+n)) \\
& + (309657600a_3^2)/(n(2+n)(4+n)) + (578027520a_2a_4)/(n(2+n)(4+n)) + (4838400a_3^2n)/((2+n)(4+n)) + (9031680a_2a_4n)/((2+n)(4+n)) \\
& + (115200a_3^2n^2)/((2+n)(4+n)) + (215040a_2a_4n^2)/((2+n)(4+n)) F_1(7, 6)t^7 + (54044160a_3a_4 + (319979520a_3a_4)/n + 2888640a_3a_4n + \\
& 47040a_3a_4n^2 + (586229760a_3a_4)/(2+n) + (3375267840a_3a_4)/(n(2+n)) + (33039360a_3a_4n)/(2+n) + (599040a_3a_4n^2)/(2+n) \\
& + (1337794560a_3a_4)/((2+n)(4+n)) + (7060193280a_3a_4)/(n(2+n)(4+n)) + (84049920a_3a_4n)/((2+n)(4+n)) \\
& + (1751040a_3a_4n^2)/((2+n)(4+n)) F_1(7, 8)t^8 + (66630144a_4^2 + (454164480a_4^2)/n + 3080448a_4^2n + 43008a_4^2n^2 + (1051975680a_4^2)/(2+n) \\
& + (6812467200a_4^2)/(n(2+n)) + (52899840a_4^2n)/(2+n) + (860160a_4^2n^2)/(2+n) + (3746856960a_4^2)/((2+n)(4+n)) \\
& + (22295347200a_4^2)/(n(2+n)(4+n)) + (209018880a_4^2n)/((2+n)(4+n)) + (3870720a_4^2n^2)/((2+n)(4+n)) F_1(7, 10)t^9, \\
\bar{P}_{2,34}(t) = & (2101248a_2^2 + 3796992a_1a_3 + 2580480a_0a_4 + 764928a_2^2n + 1406976a_1a_3n + 1038336a_0a_4n + 87552a_2^2n^2 + 165888a_1a_3n^2 + 138240a_0a_4n^2 \\
& + 3072a_2^2n^3 + 6144a_1a_3n^3 + 6144a_0a_4n^3)F_1(9, 0)t^5 + (169992192a_2a_3 + 147283968a_1a_4 + (398131200a_2a_3)/n + (339148800a_1a_4)/n \\
& + 26210304a_2a_3n + 23310336a_1a_4n + 1704960a_2a_3n^2 + 1582080a_1a_4n^2 + 38400a_2a_3n^3 + 38400a_1a_4n^3)F_1(9, 2)t^6 + (744468480a_3^2 \\
& + 1417789440a_2a_4 + (2366668800a_3^2)/n + (4482662400a_2a_4)/n + 85109760a_3^2n + 163461120a_2a_4n + 4124160a_3^2n^2 + 8033280a_2a_4n^2 \\
& + 69120a_3^2n^3 + 138240a_2a_4n^3 + (2006507520a_3^2)/(2+n) + (3776839680a_2a_4)/(2+n) + (6812467200a_3^2)/(n(2+n)) \\
& + (12799180800a_2a_4)/(n(2+n)) + (215009280a_3^2n)/(2+n) + (405749760a_2a_4n)/(2+n) + (9861120a_3^2n^2)/(2+n) + (18677760a_2a_4n^2)/(2+n) \\
& + (161280a_3^2n^3)/(2+n) + (307200a_2a_4n^3)/(2+n) F_1(9, 4)t^7 + (7447265280a_3a_4 + (28860088320a_3a_4)/n + 697221120a_3a_4n \\
& + 27601920a_3a_4n^2 + 376320a_3a_4n^3 + (44977029120a_3a_4)/(2+n) + (177371873280a_3a_4)/(n(2+n)) + (4170792960a_3a_4n)/(2+n) \\
& + (166625280a_3a_4n^2)/(2+n) + (2396160a_3a_4n^3)/(2+n) + (46227456000a_3a_4)/(2+n) + (169444638720a_3a_4)/(n(2+n)(4+n)) \\
& + (4692787200a_3a_4n)/((2+n)(4+n)) + (210124800a_3a_4n^2)/((2+n)(4+n)) + (3502080a_3a_4n^3)/((2+n)(4+n)) F_1(9, 6)t^8 + (14012866560a_4^2 \\
& + (63583027200a_4^2)/n + 1117562880a_4^2n + 37524480a_4^2n^2 + 430080a_4^2n^3 + (139098193920a_4^2)/(2+n) + (624269721600a_4^2)/(n(2+n)) \\
& + (11374755840a_4^2n)/(2+n) + (402554880a_4^2n^2)/(2+n) + (5160960a_4^2n^3)/(2+n) + (299005378560a_4^2)/((2+n)(4+n)) \\
& + (1248539443200a_4^2)/(n(2+n)(4+n)) + (26692485120a_4^2n)/((2+n)(4+n)) + (1052835840a_4^2n^2)/((2+n)(4+n))
\end{aligned}$$

$$+ (15482880a_4^2n^3)/((2+n)(4+n))F_1(9, 8)t^9,$$

$$\begin{aligned} \bar{P}_{2;35}(t) = & (701890560a_2a_3 + 595722240a_1a_4 + 313835520a_2a_3n + 271073280a_1a_4n + 50135040a_2a_3n^2 + 44482560a_1a_4n^2 + 3348480a_2a_3n^3 \\ & + 3102720a_1a_4n^3 + 76800a_2a_3n^4 + 76800a_1a_4n^4)F_1(11, 0)t^6 + (22939729920a_3^2 + 43407114240a_2a_4 + (46183219200a_3^2)/n \\ & + (87058022400a_2a_4)/n + 4403404800a_2^2n + 8379187200a_2a_4n + 404582400a_3^2n^2 + 776601600a_2a_4n^2 + 17510400a_3^3n^3 + 34099200a_2a_4n^3 \\ & + 276480a_3^2n^4 + 552960a_2a_4n^4)F_1(11, 2)t^7 + (526105313280a_3a_4 + (1402129612800a_3a_4)/n + 77001523200a_3a_4n + 5444812800a_3a_4n^2 \\ & + 182937600a_3a_4n^3 + 2257920a_3a_4n^4 + (1351740948480a_3a_4)/(2+n) + (3854617804800a_3a_4)/(n(2+n)) + (184843468800a_3a_4n)/(2+n) \\ & + (12268339200a_3a_4n^2)/(2+n) + (392601600a_3a_4n^3)/(2+n) + (4792320a_3a_4n^4)/(2+n))F_1(11, 4)t^8 + (1726114037760a_4^2 \\ & + (5549064192000a_4^2)/n + 209311334400a_4^2n + 12248678400a_4^2n^2 + 339763200a_4^2n^3 + 3440640a_4^2n^4 + (9855038914560a_4^2)/(2+n) \\ & + (32462025523200a_4^2)/(n(2+n)) + (1171537920000a_4^2)/(2+n) + (67918233600a_4^2n^2)/(2+n) + (1909555200a_4^2n^3)/(2+n) \\ & + (20643840a_4^2n^4)/(2+n) + (9673207971840a_4^2)/((2+n)(4+n)) + (29964946636800a_4^2)/(n(2+n)(4+n)) \\ & + (1238630400000a_4^2n)/((2+n)(4+n)) + (78653030400a_4^2n^2)/((2+n)(4+n)) + (2477260800a_4^2n^3)/((2+n)(4+n)) \\ & + (30965760a_4^2n^4)/((2+n)(4+n))F_1(11, 6)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{2;36}(t) = & (80864870400a_3^2 + 152292556800a_2a_4 + 41890775040a_3^2n + 79200583680a_2a_4n + 8310988800a_3^2n^2 + 15803596800a_2a_4n^2 + 783360000a_3^2n^3 \\ & + 1502822400a_2a_4n^3 + 34560000a_3^2n^4 + 67276800a_2a_4n^4 + 552960a_3^2n^5 + 1105920a_2a_4n^5)F_1(13, 0)t^7 + (14902280847360a_3a_4 \\ & + (26635508121600a_3a_4)/n + 3366924779520a_3a_4n + 390975897600a_3a_4n^2 + 24389222400a_3a_4n^3 + 762531840a_3a_4n^4 \\ & + 9031680a_3a_4n^5)F_1(13, 2)t^8 + (112962101575680a_4^2 + (263025642700800a_4^2)/n + 19775436226560a_4^2n + 1795549593600a_4^2n^2 \\ & + 88304025600a_4^2n^3 + 2190827520a_4^2n^4 + 20643840a_4^2n^5 + (280643921510400a_4^2)/(2+n) + (699182088192000a_4^2)/(n(2+n)) \\ & + (45886466949120a_4^2n)/(2+n) + (3901685760000a_4^2n^2)/(2+n) + (181252915200a_4^2n^3)/(2+n) + (4335206400a_4^2n^4)/(2+n) \\ & + (41287680a_4^2n^5)/(2+n))F_1(13, 4)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{2;37}(t) = & (46374322176000a_3a_4 + 26977370112000a_3a_4n + 6287411773440a_3a_4n^2 + 748287590400a_3a_4n^3 + 47584051200a_3a_4n^4 \\ & + 1509580800a_3a_4n^5 + 18063360a_3a_4n^6)F_1(15, 0)t^8 + (3015115737661440a_4^2 + (4900933494374400a_4^2)/n + 771863268556800a_4^2n \\ & + 106181921341440a_4^2n^2 + 8429086310400a_4^2n^3 + 382509711360a_4^2n^4 + 9031680000a_4^2n^5 + 82575360a_4^2n^6)F_1(15, 2)t^9, \end{aligned}$$

$$\begin{aligned} \bar{P}_{2;38}(t) = & (8496727090790400a_4^2 + 5421943058595840a_4^2n + 1429475929620480a_4^2n^2 + 201352418426880a_4^2n^3 + 16288815513600a_4^2n^4 \\ & + 750279720960a_4^2n^5 + 17918853120a_4^2n^6 + 165150720a_4^2n^7)F_1(17, 0)t^9. \end{aligned}$$

In addition, for each $m = 1$ ant 2 , we set $\bar{P}_{m;21}, \dots, \bar{P}_{m;29}$ by replacing $F_1(\alpha, \beta)$ in $\bar{P}_{m;1}, \bar{P}_{m;31}, \dots, \bar{P}_{m;38}$ with $F_4(\alpha + 2, \beta)$. Then the polynomials \bar{P}_1 and \bar{P}_2 satisfy (4.37).

Lemma 4.3. *If we fix f by (5.3), then the quadratic polynomial Q introduced in (5.1) is*

$$\begin{aligned} Q(t) = & -(t^2(-120n^3 + 15n^4 - 20n^2(-17 + 2\gamma^2) + 80n(-5 + 2\gamma^2) + 48(4 - 5\gamma^2 + \gamma^4)))/(120(-4+n)(-1+n)n(-4+n+2\gamma)(n-2(2+\gamma))) \\ & + ((4+n)t(-16276131183312n^{14} + 144195522471n^{15} - 24024n^{13}(-34956779489 + 101017256\gamma^2) + 24024n^{12}(-1091413895947 \\ & + 9647612593\gamma^2) + 48048n^{11}(11503210614347 - 208338062520\gamma^2 + 343501477\gamma^4) - 96096n^{10}(86484092851762 - 2690831513429\gamma^2 \\ & + 13746575773\gamma^4) - 54912n^9(-1672198360006084 + 81092078616836\gamma^2 - 863568177535\gamma^4 + 1087876980\gamma^6) \\ & + 384384n^8(-196851999990509 + 140350785058181\gamma^2 - 2625399290002\gamma^4 + 10456796778\gamma^6) + 36608n^7(127613282621952702 \\ & - 12919368395250226\gamma^2 + 387113249146176\gamma^4 - 3281855076984\gamma^6 + 3506911723\gamma^8) - 73216n^6(293944886034769944 \\ & - 41504885712933301\gamma^2 + 1887441277142967\gamma^4 - 28650688672566\gamma^6 + 99201986458\gamma^8) - 26624n^5(-2743361915337248184 \\ & + 538179410011797367\gamma^2 - 35964803885387245\gamma^4 + 887457603944373\gamma^6 - 6626977014625\gamma^8 + 6122998036\gamma^{10}) \\ & + 26624n^4(-6702855875134787664 + 1844252486332690368\gamma^2 - 177724861775663543\gamma^4 + 6706753663820793\gamma^6 - 90030461108445\gamma^8 \\ & + 275430174227\gamma^{10}) - 126510169029083136(518400 - 773136\gamma^2 + 296296\gamma^4 - 44473\gamma^6 + 3003\gamma^8 - 91\gamma^{10} + \gamma^{12}) \\ & + 4096n^3(73851295437200047392 - 29166495085469323296\gamma^2 + 4010080677791987942\gamma^4 - 222000141114956490\gamma^6 + 4830679099290759\gamma^8 \\ & - 32348872400624\gamma^{10} + 22068771021\gamma^{12}) + 294912n(741488338641461760 - 680988047191637328\gamma^2 + 187031548360862920\gamma^4 \\ & - 20523420203947089\gamma^6 + 983740623377655\gamma^8 - 19481519437003\gamma^{10} + 113683866285\gamma^{12}) - 24576n^2(13638330699842817792 \\ & - 8022570192674520912\gamma^2 + 1563643366666629248\gamma^4 - 123254065011146355\gamma^6 + 4070367032854551\gamma^8 - 49424809875077\gamma^{10} \\ & + 122111523633\gamma^{12}))/((72072000(-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)n(n+2(-6+\gamma))(n+2(-5+\gamma))(-8+n+2\gamma)(-6+n+2\gamma) \\ & (-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))) \\ & - ((4+n)(-1643703967042524341594640n^{26} + 5368446287132008064985n^{27} - 19399380n^{25}(-12312078667183768903 \\ & + 8548650008825344\gamma^2) + 116396280n^{24}(-188154359746267202441 + 397992939119576405\gamma^2) + 15519504n^{23}(91561569045158344571466 \\ & - 394138463625297521420\gamma^2 + 146821145500466459\gamma^4) - 31039008n^{22}(2233854255319471389985501 - 16347015888023344506220\gamma^2 \\ & + 18624858113469268779\gamma^4) - 8868288n^{21}(-297566391543441351862216642 + 3341679251764738463521404\gamma^2 \\ & - 7786989422390504343843\gamma^4 + 2082180149331661216\gamma^6) + 124156032n^{20}(-645646185478806923990500526 \\ & + 10424892065622910819738969\gamma^2 - 41560286663751731638039\gamma^4 + 34171310326138820756\gamma^6) \\ & + 11824384n^{19}(166716559087179289914437072673 - 3704641697545887576406117952\gamma^2 + 22848084861528312131363268\gamma^4 \\ & - 38673528070365248332668\gamma^6 + 8356948192664753234\gamma^8) - 47297536n^{18}(836047177695087946937795317581 \end{aligned}$$

$$\begin{aligned}
& -24824730976083266563974332848\gamma^2 + 222417676305776936684674128\gamma^4 - 649224557339370547252287\gamma^6 + 434165495759317982506\gamma^8) \\
& -4299776n^{17}(-150646430390265142379475548358897 + 5869365203410407422928545522500\gamma^2 - 73351432487173594082310651164\gamma^4 \\
& + 334487716518047031848878200\gamma^6 - 463882200587444473671694\gamma^8 + 86054535496741758560\gamma^{10}) \\
& + 94595072n^{16}(-90990648386483252796659897409567 + 4619689893162653217363196800293\gamma^2 - 78550331913975014317348363698\gamma^4 \\
& + 526724522476613471903737902\gamma^6 - 1270341828653797492353800\gamma^8 + 734344947023734722330\gamma^{10}) \\
& + 1323008n^{15}(68749453157974805453044039642476960 - 4589528259734675972428868825278192\gamma^2 \\
& + 105032285097177914711541282395991\gamma^4 - 997767348011575736697171471688\gamma^6 + 3796113454873809450893819164\gamma^8 \\
& - 4583230294402032647291580\gamma^{10} + 751784020020712678210\gamma^{12}) - 34398208n^{14}(21119964754907634841422004819701423 \\
& - 1934304032446972726677303515233672\gamma^2 + 59993120298500448370721659822793\gamma^4 - 791716268530305618700976911718\gamma^6 \\
& + 4481247602944470960689875414\gamma^8 - 947998449292100707677530\gamma^{10} + 4879541285794607755550\gamma^{12}) \\
& - 5292032n^{13}(-701635268411473642343080101671352744 + 103639698726812046842788066389870800\gamma^2 \\
& - 4540615718657395952262317022304717\gamma^4 + 83172974916231666793881828753908\gamma^6 - 676955645955441287624342168444\gamma^8 \\
& + 2278343159084596186659133408\gamma^{10} - 2465873988842247412208810\gamma^{12} + 360057819035337255264\gamma^{14}) \\
& + 10584064n^{12}(-40406098923768498448257834061666824 + 275238442658048504931376303680429737\gamma^2 \\
& - 19925270466799929609785040485211061\gamma^4 + 522446819404555702092363517714696\gamma^6 - 6037211306484744933793280648900\gamma^8 \\
& + 30555149746947589816079368588\gamma^{10} - 58368398441359217491783960\gamma^{12} + 26963899346507317422204\gamma^{14}) \\
& + 1245184n^{11}(-181866398939468229887486231126878529568 - 1137303144879817073961253370943177628\gamma^2 \\
& + 987426509908924218796873074249891740\gamma^4 - 41981317505041909482972778950383208\gamma^6 + 700529628251040797685311715753445\gamma^8 \\
& - 5183098346863136157288930274916\gamma^{10} + 15902084362513015885381650312\gamma^{12} - 15580436169242196997460268\gamma^{14} \\
& + 1987660323563709213471\gamma^{16}) - 4980736n^{10}(-560364189417594181513871387125570159968 \\
& + 33065937699920773931124465204820686550\gamma^2 + 367085201635124134916041311910677369\gamma^4 \\
& - 67272118851579197538928205857454208\gamma^6 + 1780096622556713050865733029825396\gamma^8 - 19315238428244951785462529232768\gamma^{10} \\
& + 90504871640126067091428131502\gamma^{12} - 15825070429598898151490259\gamma^{14} + 64720276365335873058666\gamma^{16}) \\
& - 4980736n^9(4305282125623212374866495334696753907456 - 417579013325047596978650363515219011104\gamma^2 \\
& + 11061222351746428381879599485119115592\gamma^4 + 158427677216865003738523272259468816\gamma^6 \\
& - 12274416935309109444761674698476815\gamma^8 + 210048804248799140687964198707124\gamma^{10} - 1485380420178287367444193577452\gamma^{12} \\
& + 4245770923803025749850244616\gamma^{14} - 3742176827745420340645161\gamma^{16} + 390149574308117647008\gamma^{18}) \\
& + 524288n^8(230752078991026835602168451550301862242944 - 30599941282819831164349804990025458606544\gamma^2 \\
& + 1473105458493968556869462636262938572528\gamma^4 - 22539936155325730074859722801175478026\gamma^6 \\
& - 332215514763777147471132322166256001\gamma^8 + 14470281290414642436537540693186929\gamma^{10} - 163833647893670040213595019406314\gamma^{12} \\
& + 740946143775764616629389676370\gamma^{14} - 1192727526048469832982873417\gamma^{16} + 409714251208131997815771\gamma^{18}) \\
& + 120528019644310842277342589485056000(13168189440000 - 20407635072000\gamma^2 + 8689315795776\gamma^4 - 1593719752240\gamma^6 \\
& + 151847872396\gamma^8 - 8261931405\gamma^{10} + 268880381\gamma^{12} - 5293970\gamma^{14} + 61446\gamma^{16} - 385\gamma^{18} + \gamma^{20}) \\
& + 1048576n^7(-498182721572908271020378595646961683777024 + 86012567453712132670141817562227074316736\gamma^2 \\
& - 5903384586406870096549750844003115747968\gamma^4 + 179540304186687658718510899891525201360\gamma^6 \\
& - 179091902120219909795276557084566792\gamma^8 - 21650474145886986603987528144386272\gamma^{10} + 613407805484605437753369687055751\gamma^{12} \\
& - 4607312951987830096991567890992\gamma^{14} + 12650239494804593326004632818\gamma^{16} - 9693145798851869018873712\gamma^{18} \\
& + 664325735991747048255\gamma^{20}) - 8697308774400n(691145050081891358097038997043200000 - 713384708002067331392705976488947200\gamma^2 \\
& + 236616975131841170346748416606005184\gamma^4 - 35211881742878579879646074785460496\gamma^6 + 2753437593660084457400476547658820\gamma^8 \\
& - 122677128752148229873515524048517\gamma^{10} + 3228013109951551061192583531441\gamma^{12} - 50146776451096426323810817778\gamma^{14} \\
& + 440487387247838564412164022\gamma^{16} - 1940615866229167726860009\gamma^{18} + 3050646485847429014533\gamma^{20}) \\
& - 2097152n^6(-829293857459261611023516880662992328940800 + 184132222756102459518984597362037284206272\gamma^2 \\
& - 16881200023024521017008933205987372709584\gamma^4 + 743454260498420822207899592479302882392\gamma^6 \\
& - 15504359914121154902797336576092864267\gamma^8 + 111282231773456468065317386376107024\gamma^{10} + 865724745288595716991939198688239\gamma^{12} \\
& - 17545328265069467990114475972138\gamma^{14} + 85218040285339690595633696937\gamma^{16} - 126094155100433082264568230\gamma^{18} \\
& + 30144486259114086468075\gamma^{20}) + 12582912n^5(-351551628705891538765821294942251822438400 \\
& + 100860793853425922705792709389675106184704\gamma^2 - 12059666883348996614025507411648336942720\gamma^4 \\
& + 708273769523005997029977979506116446240\gamma^6 - 21401919367003990787193324441200429536\gamma^8 \\
& + 320463166270852616931348500201528320\gamma^{10} - 1779970900823151058109852238203401\gamma^{12} - 679462555540249798452674937508\gamma^{14} \\
& + 108466048568060872934606613842\gamma^{16} - 314785003974702754694820276\gamma^{18} + 182479982755779168550735\gamma^{20}) \\
& + 2013265920n^2(5295759200658253978073439227336724480000 - 3759309784057250781321032994753880627200\gamma^2
\end{aligned}$$

$$\begin{aligned}
& + 967034291402274228425073940921576578240\gamma^4 - 115902838719600149583799298908547927504\gamma^6 \\
& + 7364375021442323485234183107190702004\gamma^8 - 264880237341394150385373641718796983\gamma^{10} \\
& + 5513827811242074890534383372431043\gamma^{12} - 65163585066541090760885870012422\gamma^{14} + 403797004776357096456457113642\gamma^{16} \\
& - 1050532585212378036630509891\gamma^{18} + 403443928028720605929071\gamma^{20} + 201326592n^3(-57126526041507732588725319770298178560000 \\
& + 2903108258993840877257927272101712908800\gamma^2 - 5788448010514486730691802837408619510784\gamma^4 \\
& + 554284340783474911178819768179685931344\gamma^6 - 28235598735182295575613337164484475288\gamma^8 \\
& + 802185014742541399965416522259893163\gamma^{10} - 12715394833710208671907835110926577\gamma^{12} + 105731809987419859536152490670342\gamma^{14} \\
& - 371137607407342697395722271746\gamma^{16} + 18847436174009758426652351\gamma^{18} + 1483939280441854337768395\gamma^{20}) \\
& - 25165824n^4(-334056794484945680905195879605750196224000 + 125885592069607672318875759862116056808960\gamma^2 \\
& - 19458623903596778007889077767132458265856\gamma^4 + 1472416018983754287543096347844012804048\gamma^6 \\
& - 5888901422990565928555726173842088632\gamma^8 + 1270883833966663038398211865429535451\gamma^{10} \\
& - 14080746148220295088809980109182193\gamma^{12} + 62520200959292705966049002591534\gamma^{14} + 76302105059124533827681994886\gamma^{16} \\
& - 1187397884016926484676412793\gamma^{18} + 1613835220374740279110595\gamma^{20}))/ (727476750000000(-20+n)(-18+n)(-16+n)(-14+n) \\
& (-12+n)(-10+n)(-8+n)(-6+n)(-4+n)(-1+n)n(n+2(-9+\gamma))(n+2(-8+\gamma))(n+2(-7+\gamma))(n+2(-6+\gamma))(n+2(-5+\gamma)) \\
& (-20+n+2\gamma)(-8+n+2\gamma)(-6+n+2\gamma)(-4+n+2\gamma)(n-2(2+\gamma))(n-2(3+\gamma))(n-2(4+\gamma))(n-2(5+\gamma))(n-2(6+\gamma))(n-2(7+\gamma)) \\
& (n-2(8+\gamma))(n-2(9+\gamma))(n-2(10+\gamma)))
\end{aligned}$$

for $t \in \mathbb{R}$. Particularly the coefficient of t^2 of $Q(t)$ is negative for any $n \geq 24$ and $0 < \gamma < 1$.

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(Seunghyeok Kim) FACULTAD DE MATEMÁTICAS, PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE, AVENIDA VICUÑA MACKENNA 4860, SANTIAGO, CHILE
E-mail address: shkim0401@gmail.com

(Monica Musso) FACULTAD DE MATEMÁTICAS, PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE, AVENIDA VICUÑA MACKENNA 4860, SANTIAGO, CHILE
E-mail address: mmusso@mat.puc.cl

(Jun Cheng Wei) DEPARTMENT OF MATHEMATICS, UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, B.C., CANADA, V6T 1Z2 AND DEPARTMENT OF MATHEMATICS, CHINESE UNIVERSITY OF HONG KONG, SHATIN, NT, HONG KONG
E-mail address: jcwei@math.ubc.ca