6. (1 point) Library/Union/setMVvectors/vectors-12.pg

The two vectors \( \mathbf{u} = \langle 1, 3, -3 \rangle \) and \( \mathbf{v} = \langle -2, -3, 1 \rangle \) determine a plane in space. Mark each of the vectors below as “\( T \)” if the vector lies in the same plane as \( \mathbf{u} \) and “\( F \)” if not.

\[
\begin{align*}
\_\_\_ & \quad 1. \quad \langle -5, -9, 5 \rangle \\
\_\_\_ & \quad 2. \quad \langle 3, -2, -2 \rangle \\
\_\_\_ & \quad 3. \quad \langle -1, -3, -1 \rangle \\
\_\_\_ & \quad 4. \quad \langle 1, 2, 1 \rangle
\end{align*}
\]

7. (1 point) Library/Union/setMVvectors/vectors-8.pg

Suppose \( \mathbf{u} = \langle 5, -3, -4 \rangle \). Then

\[
\begin{align*}
\langle -2, 3, 5 \rangle & \quad \text{makes ?} \quad \text{with} \quad \mathbf{u} \\
\langle 4, -5, -3 \rangle & \quad \text{makes ?} \quad \text{with} \quad \mathbf{u} \\
\langle 8, 0, 10 \rangle & \quad \text{makes ?} \quad \text{with} \quad \mathbf{u} \\
\langle -4, 5, -2 \rangle & \quad \text{makes ?} \quad \text{with} \quad \mathbf{u}
\end{align*}
\]

8. (1 point) Library/Union/setMVvectors/vectors-11a.pg

Find a vector \( \mathbf{v} \) that is perpendicular to the plane through the points

\[
\mathbf{A} = (-4, 1, 5), \quad \mathbf{B} = (5, 1, 2), \quad \text{and} \quad \mathbf{C} = (0, 4, 4).
\]

\[\mathbf{v} = \quad \text{.} \]

9. (1 point) Library/Union/setMVvectors/an12_3_25/an12_3_25b.pg

The distance \( d \) of a point \( P \) to the line through points \( A \) and \( B \) is the length of the component of \( \overrightarrow{AP} \) that is orthogonal to \( \overrightarrow{AB} \), as indicated in the diagram.

So the distance from \( P = (-1, -4, 4) \) to the line through the points \( A = (-5, 0, 1) \) and \( B = (-4, 1, -2) \) is \( \quad \text{.} \)
11. (1 point) Library/Union/setMVlinesplanes/planes-1.png
The planes $3x + 5y + 5z = -40$ and $4y - 2x + 5z = -36$ are not parallel, so they must intersect along a line that is common to both of them. The vector parametric equation for this line is

$L(t) =$ ________________.

12. (1 point) Library/Union/setMVlinesplanes/an12_5_17a.png
Give a vector parametric equation for the line through the point $(5, -3)$ that is perpendicular to the line $\langle 4 + 4t, 5 + 2t \rangle$:

$L(t) =$ ________________.

13. (1 point) Library/Union/setMVlinesplanes/an12_5_17.png
Give a vector parametric equation for the line through the point $(2, 2, 0)$ that is parallel to the line $\langle 4 - 3t, 2t - 5, 5 - t \rangle$:

$L(t) =$ ________________.

14. (1 point) Library/Union/setMVlinesplanes/an12_6_11.png
An implicit equation for the plane passing through the points $(0, 4, -5)$, $(4, 1, -1)$, and $(2, -1, -3)$ is ________________.

15. (1 point) Library/Union/setMVlinesplanes/an12_6_24.png
An implicit equation for the plane passing through the point $(5, 0, 2)$ that is perpendicular to the line $L(t) = \langle 1 + 4t, t - 2, 1 \rangle$ is ________________.

16. (1 point) Library/Union/setMVlinesplanes/an12_6_17.png
The line $L(t) = \langle 2t - 5, 4t - 5, 1 + t \rangle$ intersects the plane $2x + 4y - z = 7$ at the point ________________ when $t =$ ________________.

18. (1 point) Library/OSU/accelerated_calculus_and_analytic_geometry_ii/hmwk7/prob12.pg
Given the vector equation $\mathbf{r}(t) = (-5 + 5t)i + (0 + 1t)j + (-2 + 2t)k$, rewrite this in terms of the parametric equations for the line.

$x(t) =$ __________
$y(t) =$ __________
$z(t) =$ __________

25. (1 point) Library/UMN/calculusStewartET/s_12_1_15.pg
Answer the following questions about the sphere whose equation is given by $x^2 + y^2 + z^2 - 10x + 4y = -4$.

1. Find the radius of the sphere. Radius: $r =$ __________
2. Find the center of the sphere. Write the center as a point $(a, b, c)$ where $a$, $b$, and $c$ are numbers. Center: __________

30. (1 point) Library/UMN/calculusStewartET/s_12_3_38.pg
Find the scalar and vector projections of $\mathbf{b}$ onto $\mathbf{a}$, where $\mathbf{a} = \langle -1, 1, 2 \rangle$ and $\mathbf{b} = \langle -2, 8, 14 \rangle$.

1. $\text{comp}_a \mathbf{b} =$ __________
2. $\text{proj}_a \mathbf{b} =$ __________
Suppose we have the triangle with vertices \( P(1,6,1) \), \( Q(-3,6,-4) \), and \( R(5,2,2) \). Answer the following questions.

1. Find a non-zero vector orthogonal to the plane through the points \( P, Q, \) and \( R \).
   Answer: 
   
2. Find the area of the triangle \( \triangle PQR \).
   Area: 

Find the angle \( \theta \) between the vectors \( \mathbf{a} = 6i - j - 4k \) and \( \mathbf{b} = 2i + j - 2k \).

\[ \theta = \frac{\pi}{2} \]

Find an equation of the sphere that passes through the origin and whose center is \((-2,1,5)\). *Be sure that your formula is monic.*

Equation: 

Find an equation of the largest sphere with center \((4,3,6)\) and is contained in the first octant. *Be sure that your formula is monic.*

Equation: 

Find a vector \( \mathbf{a} \) that has the same direction as \((-8,9,8)\) but has length 5.

Answer: 

Find the intercepts of the plane \( 5x + y + 9z = 45 \). *Write your answers as points \((a,b,c)\) where \( a, b, \) and \( c \) are numbers.*

1. The \( x \)-axis intercept.
   Answer: 
   
2. The \( y \)-axis intercept.
   Answer: 
   
3. The \( z \)-axis intercept.
   Answer: 
   
Note: If there is no intersection, write "none".

Find the distance from \((-3,7,-14)\) to each of the following:

1. The \( xy \)-plane.
   Answer: 
   
2. The \( yz \)-plane.
   Answer: 
   
3. The \( xz \)-plane.
   Answer: 
   
4. The \( x \)-axis.
   Answer: 

5. The y-axis.
Answer: ________
6. The z-axis.
Answer: ________

56. (1 point) 
Match the equations of the spheres with one of the graphs below.

1. $x^2 - 4x + y^2 + z^2 = -\frac{15}{4}$
2. $(x - 1)^2 + (y - 1)^2 + z^2 = 1$
3. $x^2 - 4x + y^2 - 4y + z^2 - 2z = -\frac{35}{4}$
4. $x^2 - 2x + y^2 + 2y + z^2 - 2z = -2$

Note: You can click on the graphs to enlarge the images.

58. (1 point) 
Match each function with one of the graphs below.
1. \( f(x, y) = \sqrt{4x^2 + y^2} \)
2. \( f(x, y) = \sqrt{4 - 4x^2 - y^2} \)
3. \( f(x, y) = y^2 + 1 \)
4. \( f(x, y) = e^{-y} \)

**Note:** You can click on the graphs to enlarge the images.

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**63. (1 point)** Library/Rochester/setVectors2DotProduct/UR_VC_1_15.png

Let \( \mathbf{a} = (-3, 2, 7) \) and \( \mathbf{b} = (1, 2, 8) \) be vectors.

(A) Find the scalar projection of \( \mathbf{b} \) onto \( \mathbf{a} \).

Scalar Projection: __________

(B) Decompose the vector \( \mathbf{b} \) into a component parallel to \( \mathbf{a} \) and a component orthogonal to \( \mathbf{a} \).

Parallel component: (_________,
_________,
_________)
Orthogonal Component: (_________,
_________,
_________)

---

**67. (1 point)** Library/Rochester/setVectors5Coordinates/urvc_3_5.png
What are the spherical coordinates of the point whose rectangular coordinates are (1, 2, 3)?

$p =$
$\theta =$
$\phi =$

68. (1 point) Library/Rochester/setVectors5Coordinates/urvc_3_4.pg
What are the rectangular coordinates of the point whose spherical coordinates are $(1, \frac{1}{6}\pi, -\frac{1}{6}\pi)$?

$x =$
$y =$
$z =$

69. (1 point) Library/Rochester/setVectors5Coordinates/urvc_3_7.pg
Match the given equation with the verbal description of the surface:

A. Half plane
B. Circular Cylinder
C. Cone
D. Elliptic or Circular Paraboloid
E. Plane
F. Sphere

_1. $\rho = 4$
_2. $\rho \cos(\phi) = 4$
_3. $r = 4$
_4. $\phi = \frac{\pi}{3}$
_5. $r^2 + z^2 = 16$
_6. $\theta = \frac{\pi}{3}$
_7. $z = r^2$
_8. $r = 2\cos(\theta)$
_9. $\rho = 2\cos(\phi)$

70. (1 point) Library/Rochester/setVectors5Coordinates/urvc_3_3.pg
What are the cylindrical coordinates of the point whose rectangular coordinates are $(x = -4, y = 4, z = -5)$?

$r =$
$\theta =$
$z =$

71. (1 point) Library/Rochester/setVectors5Coordinates/urvc_3_6.pg
What are the cylindrical coordinates of the point whose spherical coordinates are $(1, 2, \frac{13\pi}{6})$?

$r =$
$\theta =$
85. (1 point) Library/272/setStewart12_5/problem_19.pg

Find the distance from the point (3, -5, -1) to the plane \(-5x + 5y - 4z = 4\).

86. (1 point) Library/272/setStewart12_5/problem_5.pg

Find the vector and parametric equations for the line through the point \(P = (3, -4, -5)\) and the point \(Q = (2, -9, -1)\).

Vector Form: \(\mathbf{r} = \langle ___, ___, -5 \rangle + t\langle ___, ___, 4 \rangle\)

Parametric form (parameter \(t\), and passing through \(P\) when \(t = 0\)):

\[x = x(t) = ____________
\[y = y(t) = ____________
\[z = z(t) = ____________

102. (1 point) Library/272/setStewart12_4/problem_5.pg

Find the distance the point \(P(7, 2, -8)\), is to the plane through the three points

\(Q(2, 4, -3)\), \(R(4, 7, 2)\), and \(S(4, 8, -4)\).

110. (1 point) Library/Hope/Multi1/01-05-Lines-planes/Lines-01.pg

Find the distance between the skew lines \(P(t) = (-4, 3, 5) + t\langle 1, -5, 4 \rangle\) and \(Q(t) = (5, 2, 5) + t\langle 1, -5, -5 \rangle\). Hint: Take the cross product of the slope vectors of \(P\) and \(Q\) to find a vector normal to both of these lines.

distance = ____________

148. (1 point) Library/FortLewis/Calc3/12-1-Two-variable-functions/HGM4-12-1-29-Functions-of-two-variables.pg

Find a formula for the shortest distance from a point \((a, b, c)\) to the \(y\)-axis.

distance = ____________

149. (1 point) Library/FortLewis/Calc3/12-1-Two-variable-functions/HGM4-12-1-28-Functions-of-two-variables.pg (a) Describe the set of points whose distance from the \(z\)-axis equals the distance from the \(xy\)-plane.

- A. A cylinder opening along the \(y\)-axis
- B. A cone opening along the \(y\)-axis
- C. A cone opening along the \(x\)-axis
- D. A cone opening along the \(z\)-axis
- E. A cylinder opening along the \(z\)-axis
- F. A cylinder opening along the \(x\)-axis
(b) Find the equation for the set of points whose distance from the z-axis equals the distance from the xy-plane.

- A. \( x^2 + y^2 = r^2 \)
- B. \( x^2 = y^2 + z^2 \)
- C. \( x^2 + z^2 = r^2 \)
- D. \( y^2 = x^2 + z^2 \)
- E. \( z^2 = x^2 + y^2 \)
- F. \( y^2 + z^2 = r^2 \)

164. (1 point) Library/Michigan/Chap12Sec4/Q11.pg
Find an equation for the plane containing the line in the xy-plane where \( x = 3 \), and the line in the yz-plane where \( z = 4 \).

equation: ________________

198. (1 point) Library/Michigan/Chap17Sec5/Q11.pg
For a sphere parameterized using the spherical coordinates \( \theta \) and \( \phi \), describe in words the part of the sphere given by the restrictions

\[ \frac{\pi}{6} \leq \theta \leq \frac{\pi}{4} \quad 0 \leq \phi \leq \pi \]

and

\[ \frac{\pi}{2} \leq \theta \leq \pi \quad 0 \leq \phi \leq \pi. \]

Then pick the figures below that match the surfaces you described.

\[ \frac{\pi}{6} \leq \theta \leq \frac{\pi}{4} \quad 0 \leq \phi \leq \pi: [?/1/2/3/4/5/6/7/8] \]
\[ \frac{\pi}{2} \leq \theta \leq \pi \quad 0 \leq \phi \leq \pi: [?/1/2/3/4/5/6/7/8] \]

(Click on any graph to see a larger version.)
Match the surfaces with the appropriate descriptions.

1. \( z = 2x + 3y \)
2. \( z = x^2 \)
3. \( x^2 + y^2 = 5 \)
4. \( z = 2x^2 + 3y^2 \)
5. \( z = y^2 - 2x^2 \)
6. \( x^2 + 2y^2 + 3z^2 = 1 \)
7. \( z = 4 \)

A. circular cylinder
B. ellipsoid
C. horizontal plane
D. elliptic paraboloid
E. hyperbolic paraboloid
F. parabolic cylinder
G. nonhorizontal plane