Table of Derivatives

Throughout this table, a and b are constants, independent of x.

$F(x)$	$F'(x) = \frac{dF}{dx}$
$af(x) + bg(x)$	$af'(x) + bg'(x)$
$f(x) + g(x)$	$f'(x) + g'(x)$
$f(x) - g(x)$	$f'(x) - g'(x)$
$af(x)$	$af'(x)$
$f(x)g(x)$	$f'(x)g(x) + f(x)g'(x)$
$f(x)g(x)h(x)$	$f'(x)g(x)h(x) + f(x)g'(x)h(x) + f(x)g(x)h'(x)$
$\frac{f(x)}{g(x)}$	$\frac{f'(x)g(x)-f(x)g'(x)}{g(x)^2}$
$\frac{1}{g(x)}$	$-\frac{g'(x)}{g(x)^2}$
$f\big(g(x)\big)$	$f'\big(g(x)\big)g'(x)$
1	0
a	0
x^a	ax^{a-1}
$g(x)^a$	$ag(x)^{a-1}g'(x)$
$\sin x$	$\cos x$
$\sin g(x)$	$g'(x)\cos g(x)$
$\cos x$	$-\sin x$
$\cos g(x)$	$-g'(x)\sin g(x)$
$\tan x$	$\sec^2 x$
$\csc x$	$-\csc x \cot x$
$\sec x$	$\sec x \tan x$
$\cot x$	$-\csc^2 x$
e^x	e^x
$e^{g(x)}$	$g'(x)e^{g(x)}$
a^x	$(\ln a)\ a^x$
$\ln x$	$\frac{1}{x}$
$\ln g(x)$	$\frac{g'(x)}{g(x)}$
$\log_a x$	$\frac{1}{x\ln a}$
$\arcsin x$	$\frac{1}{\sqrt{1-x^2}}$
$\arcsin g(x)$	$\frac{g'(x)}{\sqrt{1-g(x)^2}}$
$\arccos x$	$-\frac{1}{\sqrt{1-x^2}}$
$\arctan x$	$\frac{1}{1+x^2}$
$\arctan g(x)$	$\frac{g'(x)}{1+g(x)^2}$
$\operatorname{arccsc} x$	$-\frac{1}{x\sqrt{1-x^2}}$
$\operatorname{arcsec} x$	$\frac{1}{x\sqrt{1-x^2}}$
$\operatorname{arccot} x$	$-\frac{1}{1+x^2}$

Table of Indefinite Integrals

Throughout this table, a and b are given constants, independent of x and C is an arbitrary constant.

$f(x)$	$F(x) = \int f(x)\ dx$
$af(x) + bg(x)$	$a\int f(x)\ dx + b\int g(x)\ dx\ +\ C$
$f(x) + g(x)$	$\int f(x)\ dx + \int g(x)\ dx\ +\ C$
$f(x) - g(x)$	$\int f(x)\ dx - \int g(x)\ dx\ +\ C$
$af(x)$	$a\int f(x)\ dx\ +\ C$
$u(x)v'(x)$	$u(x)v(x) - \int u'(x)v(x)\ dx\ +\ C$
$f\big(y(x)\big)y'(x)$	$F\big(y(x)\big)$ where $F(y) = \int f(y)\ dy$
1	$x + C$
a	$ax + C$
x^a	$\frac{x^{a+1}}{a+1} + C$ if $a \neq -1$
$\frac{1}{x}$	$\ln\|x\| + C$
$g(x)^a g'(x)$	$\frac{g(x)^{a+1}}{a+1} + C$ if $a \neq -1$
$\sin x$	$-\cos x + C$
$g'(x)\sin g(x)$	$-\cos g(x) + C$
$\cos x$	$\sin x + C$
$\tan x$	$\ln\|\sec x\| + C$
$\csc x$	$\ln\|\csc x - \cot x\| + C$
$\sec x$	$\ln\|\sec x + \tan x\| + C$
$\cot x$	$\ln\|\sin x\| + C$
$\sec^2 x$	$\tan x + C$
$\csc^2 x$	$-\cot x + C$
$\sec x \tan x$	$\sec x + C$
$\csc x \cot x$	$-\csc x + C$
e^x	$e^x + C$
$e^{g(x)}g'(x)$	$e^{g(x)} + C$
e^{ax}	$\frac{1}{a}\ e^{ax} + C$
a^x	$\frac{1}{\ln a}\ a^x + C$
$\ln x$	$x\ln x - x + C$
$\frac{1}{\sqrt{1-x^2}}$	$\arcsin x + C$
$\frac{g'(x)}{\sqrt{1-g(x)^2}}$	$\arcsin g(x) + C$
$\frac{1}{\sqrt{a^2-x^2}}$	$\arcsin\frac{x}{a} + C$
$\frac{1}{1+x^2}$	$\arctan x + C$
$\frac{g'(x)}{1+g(x)^2}$	$\arctan g(x) + C$
$\frac{1}{a^2+x^2}$	$\frac{1}{a}\arctan\frac{x}{a} + C$
$\frac{1}{x\sqrt{1-x^2}}$	$\operatorname{arcsec} x + C$

Properties of Exponentials

In the following, x and y are arbitrary real numbers, a and b are arbitrary constants that are strictly bigger than zero and e is 2.7182818284, to ten decimal places.

1) $e^0 = 1, \;\; a^0 = 1$

2) $e^{x+y} = e^x e^y, \;\; a^{x+y} = a^x a^y$

3) $e^{-x} = \frac{1}{e^x}, \;\; a^{-x} = \frac{1}{a^x}$

4) $\big(e^x\big)^y = e^{xy}, \; \big(a^x\big)^y = a^{xy}$

5) $\frac{d}{dx} e^x = e^x, \;\; \frac{d}{dx} e^{g(x)} = g'(x) e^{g(x)}, \;\; \frac{d}{dx} a^x = (\ln a) \; a^x$

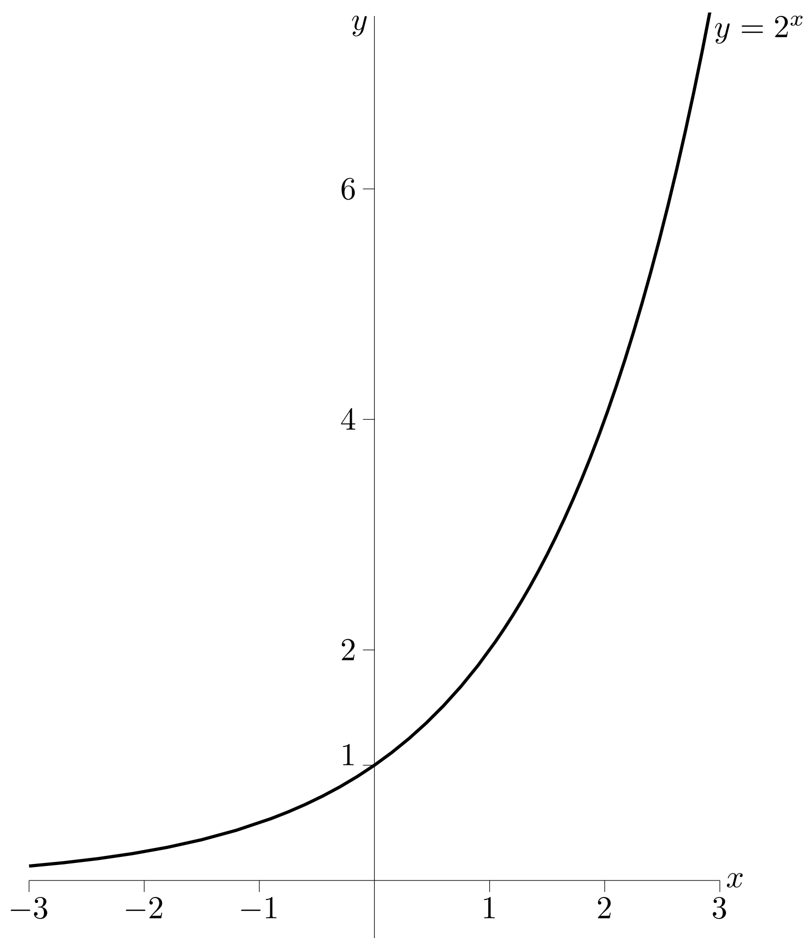
6) $\int e^x \; dx = e^x + C, \;\; \int e^{ax} \; dx = \frac{1}{a} e^{ax} + C$ if $a \neq 0$

7) $\lim\limits_{x\to\infty} e^x = \infty, \;\; \lim\limits_{x\to-\infty} e^x = 0$

$\lim\limits_{x\to\infty} a^x = \infty, \;\; \lim\limits_{x\to-\infty} a^x = 0$ if $a > 1$

$\lim\limits_{x\to\infty} a^x = 0, \;\; \lim\limits_{x\to-\infty} a^x = \infty$ if $0 < a < 1$

8) The graph of 2^x is given below. The graph of a^x, for any $a > 1$, is similar.



Properties of Logarithms

In the following, x and y are arbitrary real numbers that are strictly bigger than 0, a is an arbitrary constant that is strictly bigger than one and e is 2.7182818284, to ten decimal places.

1) $e^{\ln x} = x, \;\; a^{\log_a x} = x, \;\; \log_e x = \ln x, \quad \log_a x = \frac{\ln x}{\ln a}$

2) $\log_a \left(a^x\right) = x$, $\ln \left(e^x\right) = x$

   $\ln 1 = 0, \;\; \log_a 1 = 0$

   $\ln e = 1, \;\; \log_a a = 1$

3) $\ln(xy) = \ln x + \ln y, \;\; \log_a(xy) = \log_a x + \log_a y$

4) $\ln\left(\frac{x}{y}\right) = \ln x - \ln y, \;\; \log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$

   $\ln\left(\frac{1}{y}\right) = -\ln y, \;\; \log_a\left(\frac{1}{y}\right) = -\log_a y,$

5) $\ln(x^y) = y \ln x, \;\; \log_a(x^y) = y \log_a x$

6) $\frac{d}{dx} \ln x = \frac{1}{x}$, $\frac{d}{dx} \ln(g(x)) = \frac{g'(x)}{g(x)}$, $\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$

7) $\int \frac{1}{x} dx = \ln|x| + C$, $\int \ln x \; dx = x \ln x - x + C$

8) $\lim_{x\to\infty} \ln x = \infty$, $\lim_{x\to 0} \ln x = -\infty$

   $\lim_{x\to\infty} \log_a x = \infty$, $\lim_{x\to 0} \log_a x = -\infty$

9) The graph of $\ln x$ is given below. The graph of $\log_a x$, for any $a > 1$, is similar.