



Derivatives

F(x)	F'(x)
C , C is a Constant	0
Cx , C is a Constant Example: 7x	C 7
x^k Example: $-3x^6$	kx^{k-1} $(-3)(6)x^{6-1} = -18x^5$
U^k , U is a function in x Example: $(x^2 - 1)^4$	$kU^{k-1} \times U'$ $4(x^2 - 1)^3 \times (2x) = 8x(x^2 - 1)^3$
\sqrt{x}	$\frac{1}{2\sqrt{x}}$
\sqrt{U} , U is a function in x Example: $\sqrt{3 - 2x}$	$\frac{U'}{2\sqrt{U}}$ $\frac{-2}{2\sqrt{3 - 2x}} = \frac{-1}{\sqrt{3 - 2x}}$
$u + v$, u and v functions in x Example: $2x + 100 - 3x^2$	$u' + v'$ $2 + 0 - 6x = 2 - 6x$
$u \times v$, u and v functions in x Example: $(-x + 7)(3x^2 - 10)$	$u'v + v'u$ $u = -x + 7 \Rightarrow u' = -1$ $v = 3x^2 - 10 \Rightarrow v' = 6x$ $u'v + v'u =$ $(-1)(3x^2 - 10) + (6x)(-x + 7)$ $-3x^2 + 10 - 6x^2 + 42x = -9x^2 + 42x + 10$
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F(x)	F'(x)
$\frac{u}{v}$ <p>, u and v functions in x</p> <p>Example: $\frac{2-3x}{x+1}$</p>	$\frac{u'v - v'u}{v^2}$ $u = 2 - 3x \Rightarrow u' = -3$ $v = x + 1 \Rightarrow v' = 1$ $\frac{u'v - v'u}{v^2} =$ $\frac{(-3)(x+1) - (1)(2-3x)}{(x+1)^2}$ $= \frac{-3x - 3 - 2 + 3x}{(x+1)^2} = \frac{-5}{(x+1)^2}$
e^x	e^x
e^U , U function in x Example: e^{x^2}	$U'e^U$ $2xe^{x^2}$
$\ln x$	$\frac{1}{x}$
$\ln U$, U function in x Example: $\ln(x^2 - 3x + 1)$	$\frac{U'}{U}$ $\frac{2x-3}{x^2-3x+1}$
$\sin x$ $\sin U$, U function in x	$\cos x$ $U' \cos U$
$\cos x$ $\cos U$, U function in x	$-\sin x$ $-U' \sin U$