

## Derivative Rules

	Function	Derivative	Example	
<b>Constant Function</b>	$y = \text{constant}$	$dy/dx = 0$	$y = 7$	$y' = 0$
<b>x</b>	$y = x$	$dy/dx = 1$	$y = x$	$y' = 1$
<b>Power of x Rule</b>	$y = x^n$	$dy/dx = n(x^{n-1})$	$y = x^6$	$y' = 6x^5$
<b>Multiple Rule</b>	$y = k \cdot f(x)$	$dy/dx = k \cdot f'(x)$	$y = 3x^4$	$y' = 12x^3$
<b>Addition and Subtraction Rule</b>	$y = f(x) + g(x)$	$dy/dx = f'(x) + g'(x)$	$y = 3x^2 + 4x$	$y' = 6x + 4$
<b><math>e^x</math></b>	$y = e^x$	$dy/dx = e^x$	$y = e^x$	$y' = e^x$
<b>Number raised to a power of x</b>	$y = b^x$	$dy/dx = b^x \ln b$	$y = 3^x$	$y' = 3^x \ln 3$
<b>Natural log of x</b>	$y = \ln x$	$dy/dx = \frac{1}{x}$	$y = \ln x$	$y' = \frac{1}{x}$
<b>Log of x</b>	$y = \log_b x$	$dy/dx = \frac{1}{x (\ln b)}$	$y = \log_4 x$	$y' = \frac{1}{x (\ln 4)}$

**Product Rule:**  $y' = (\text{Front})(\text{Back}') + (\text{Back})(\text{Front}')$

$$y = (x^2 + 4)(3x - 5) \qquad y' = (x^2 + 4)(3) + (3x - 5)(2x)$$

**Quotient Rule:**  $y' = \frac{(\text{Bottom})(\text{Top}') - (\text{Top})(\text{Bottom}')}{(\text{Bottom})^2}$

$$y = \frac{(3x - 1)}{(x^2 + 4)} \qquad y' = \frac{(x^2 + 4)(3) - (3x - 1)(2x)}{(x^2 + 4)^2}$$

**Chain Rule:**  $y' = (\text{Outside}')(\text{Inside}')$

$$y = (3x^2 + 5x)^4 \qquad y' = 4(3x^2 + 5x)^3(6x + 5)$$