

Derivative Formulas

Derivative Rules	Examples
<p>1. The main Rules: If $y = x^a$; then $y' = ax^{a-1}$ If $y = x$; then $y' = 1$ If $y = c$; then $y' = 0$</p>	<p>Ex: $y = x^{-2} - x + 2$ $y' = -2x^{-3} - 1$ Ex: $y = 3x^4 - 5x + 4$ $y' = 12x^3 - 5$</p>
<p>2. The ln rule If $y = \ln f(x)$; then $y' = \frac{f'(x)}{f(x)}$</p>	<p>Ex: $y = \ln(5x - 4)$ $y' = \frac{5}{5x - 4}$</p>
<p>3. The e rule: If $y = e^{f(x)}$; then $y' = f'(x) \cdot e^{f(x)}$ $y' =$ (derivative of the power) \cdot the original</p>	<p>Ex: $y = 4e^{-5x}$ $y' = 4(-5)e^{-5x} = -20e^{-5x}$</p>
<p>4. The a rule: If $y = a^x$; then $y' = \ln a \cdot a^x$</p>	<p>Ex: $y = 4 \cdot 5^x$ $y' = 4 \cdot \ln 5 \cdot 5^x$</p>
<p>5. The chain (power) rule: If $y = (f(x))^n$; then $y' = n(f(x))^{n-1} \cdot f'(x)$ $y' =$ (derivative of outside) \cdot (derivative of inside)</p>	<p>Ex: $y = (5 - 3x)^9$ $y' = 9(5 - 3x)^8 \cdot (-3)$ $= -27(5 - 3x)^8$</p>
<p>6. The mutiplication rule: $y = f(x) \cdot g(x)$; then $y' = f'(x) \cdot g(x) + g'(x) \cdot f(x)$ or, it is easier this way: If $y =$ (first)(second); then: $y' =$ (derivative of first)(second) + (derivative of second)(first)</p>	<p>Ex: $y = (3x - 2)(5 - 6x)$ $y' = 3(5 - 6x) + (-6)(3x - 2)$ $= 15 - 18x - 18x + 12$ $= 27 - 36x$</p>
<p>7. The quotient rule: $y = \frac{f(x)}{g(x)}$; then $y' = \frac{f'(x) \cdot g(x) - g'(x) \cdot f(x)}{[g(x)]^2}$ or, it is easier this way: If $y = \frac{\text{Num}}{\text{Den}}$; then: $y' = \frac{(\text{derivative of Num})(\text{Den}) - (\text{derivative of Den})(\text{Num})}{\text{Den}^2}$</p>	<p>Ex: $y = \frac{2x - 3}{5x + 1}$ $y' = \frac{(2)(5x + 1) - (5)(2x - 3)}{(5x + 1)^2}$ $= \frac{10x + 2 - 10x + 15}{(5x + 1)^2}$ $= \frac{17x}{(5x + 1)^2}$</p>

- Rules 1, 2, 3 and 4 are from sections 3.1 and 3.2.
- Rule 5 is from section 3.3.
- Rules 6 and 7 are from section 3.4.