Basic Rules of Differentiation

Basic Rules	*Example(s):* Find derivative of each given function.		
Derivative of a Constant $= 0$	$f(x) = 3$ $f'(x) = 0$	$g(x) = e$ $g'(x) = 0$ $e \approx 2.718\ldots$	
Power Rule: $\frac{d}{dx}(x^{n}) = nx^{n-1}$ $\#$	$f(x) = x^{4} \to \#$ $f'(x) = 4x^{4-1}$ $= 4x^3$	$g(x) = x^{1} \leftarrow \#$ $g'(x) = 1x^{1-1}$ $= 1x^0$ $= 1$	$h(x) = \sqrt{x} = x^{1/2}$ $h'(x) = \frac{1}{2}x^{-1/2}$ $= \frac{1}{2x^{1/2}}$ $= \frac{1}{2\sqrt{x}}$ all 3 are acceptable answers $\frac{1}{2} \cdot 1$ $\frac{1}{2} \cdot \frac{2}{2}$ $\frac{1}{2}$
Coefficient Rule: $\frac{d}{dx}(c f(x)) = c\frac{d}{dx}(f(x))$ $\#$	$f(x) = 3x^5$ $f'(x) = 3(5x^4)$ $= 15x^4$	$g(x) = -2x^3$ $g'(x) = -2(3x^2)$ $= -6x^2$	$h(x) = \frac{x^5}{4} = \frac{1}{4}x^5$ $h'(x) = \frac{1}{4}(5x^4)$ $= \frac{5}{4}x^4$ or $\frac{5x^4}{4}$
Sum & Difference Rule: $\frac{d}{dx}(f(x) \pm g(x)) = \frac{d}{dx}(f(x)) \pm \frac{d}{dx}(g(x))$	$f(x) = x^2 + 3x + 2$ $f'(x) = 2x^1 + 3(1x^0) + 0$ $= 2x + 3$	$g(x) = 4x^5 - 7x^2 + 3x$ $g'(x) = 20x^4 - 14x + 3$	