Derivative Rules

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1. $\frac{d}{dx}(c) = 0$

2. Power Rule $\frac{d}{dx}\left[x^n\right] = nx^{(n-1)}$

3. Constant Multiple Rule $\frac{d}{dx}\left[cf(x)\right] = cf'(x)$

4. Sum & Difference Rule $\frac{d}{dx}\left(u \pm v\right) = \frac{du}{dx} \pm \frac{dv}{dx}$

5. $\frac{d}{dx}\left[e^x\right] = e^x$

**1. If $f(x) = x^{3/2}$, then $f'(4) =$

$f'(x) = \frac{3}{2}x^{1/2}$

$f'(4) = \frac{3}{2}(4)^{1/2} = 3$

For 2 - 3, differentiate each function.

2. $\frac{1}{2\sqrt[3]{x^2}} = f(x)$

$f(x) = \frac{1}{2}x^{-2/3}$

$f'(x) = \left(\frac{1}{2}\right)\left(-\frac{2}{3}\right)\left(x^{-5/3}\right)$

$= -\frac{1}{3x^{5/3}}$

3. $a(t) = \frac{-(t^4)}{2} + 3t^3 - 2t$

$a'(t) = -\frac{1}{2}(4)t^3 + 9t^2 - 2$

$= -2t^3 + 9t^2 - 2$

**4. $\frac{d}{dx}\left(\frac{1}{x^3} - \frac{1}{x} + x^2\right)$ at $x = -1$ is

$\frac{d}{dx}\left(x^{-3} - x^{-1} + x^2\right) = -3x^{-4} + x^{-2} + 2x = \frac{-3}{x^4} + \frac{1}{x^2} + 2x$

@ $x = -1 \Rightarrow -3 + 1 - 2 = -4$

5. Find $f'(x)$ for $f(x) = 5e^x + 7x^\pi - 3$

$f'(x) = 5e^x + 7 \cdot \pi\, x^{(\pi-1)}$