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10 – Basic Derivative Rules

Theorem: Constant Rule & Power Rule

Let c be any constant and n any real number.

$$\frac{d}{dx}(c) = 0 \qquad \text{and} \qquad \frac{d}{dx}(x^n) = nx^{n-1}$$

1. Find $f'(x)$, if possible.

(a) $f(x) = x^{\pi}$

(b) $f(x) = \dfrac{1}{\sqrt[3]{x}}$

(c) $f(x) = \pi^x$

(d) $f(x) = \pi^2$

Theorem: Sum, Difference, and Constant Multiple Rules

Let f and g be differentiable, and let c be any constant.

1. $\frac{d}{dx}[cf(x)] = c\frac{d}{dx}[f(x)]$ or alternatively $[cf(x)]' = cf'(x)$

2. $\frac{d}{dx}[f(x) \pm g(x)] = \frac{d}{dx}[f(x)] \pm \frac{d}{dx}[g(x)]$ or alternatively $[f(x) \pm g(x)]' = f'(x) \pm g'(x)$

2. Compute the derivative.

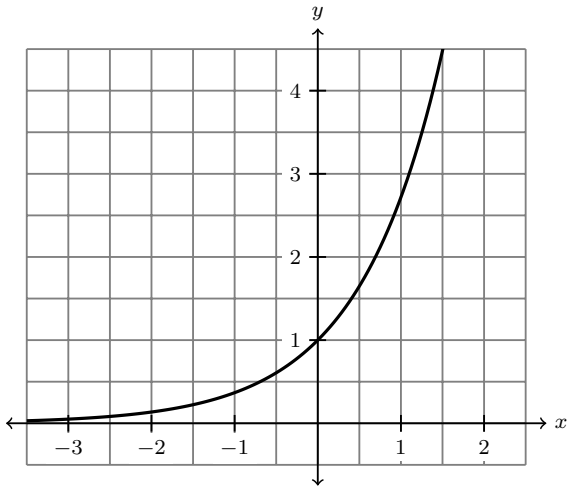
(a) $f(x) = 7 + 0.5x^2 - \dfrac{3}{\sqrt{x}} + \pi^3$

(b) $g(x) = \left(x + x^{-1}\right)\left(7 + \pi x - x^2\right)$

(c) $h(t) = \dfrac{t^5 - \sqrt{t}}{3t^2}$

3. Find all points where the graph of $y = \dfrac{1}{x^2} + 16x^2$ has a horizontal tangent line.

4. The graph of $f(x) = e^x$ is below.



(a) What is the *geometric* meaning of $f'(0)$?

(b) Use the graph of $f(x)$ to find $f'(0)$.

Theorem: Derivative of e^x

$\frac{d}{dx}\left(e^x\right) = e^x$

5. Find an equation for the tangent line to the graph of $f(x) = 7e^x - \sqrt{x} + 1$ where $x = 1$.