

CALCULUS: Graphical, Numerical, Algebraic by Finney, Demana, Waits and Kennedy
 Chapter 3: Derivatives 3.3: Derivative of a function pg. 116-126

$$f(x) = 5$$

$$f'(x) = 0$$

$$f(x) = x^1$$

$$f'(x) = 1$$

$$f(x) = x^2$$

$$f'(x) = 2x$$

$$f(x) = x^3$$

$$f'(x) = 3x^2$$

$$f(x) = x^4$$

$$f'(x) = 4x^3$$

What you'll Learn About

- How to find the derivative of:
- Functions with positive and negative integer powers
- Functions with products and quotients

A) Using a definition of the derivative find the derivative of $y = x^2$ at $x = a$

$$\lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$$

$$\frac{(x+a)(x-a)}{x-a}$$

$$\lim_{x \rightarrow a} \frac{x^2 - a^2}{x - a}$$

$$\lim_{x \rightarrow a} x + a = 2a$$

B) Using a definition of the derivative find the derivative of $y = x^3$ at $x = a$

$$\lim_{x \rightarrow a} \frac{x^3 - a^3}{x - a}$$

~~$$\frac{(x-a)(x^2 + ax + a^2)}{x-a}$$~~

$$\lim_{x \rightarrow a} x^2 + ax + a^2 = a^2 + a^2 + a^2$$

$$= 3a^2$$

C) Using a definition of the derivative find the derivative of ~~$y = x^2$~~ at $x = a$

$$\lim_{x \rightarrow a} \frac{x^4 - a^4}{x - a}$$

$$y = x^4$$

$$\lim_{x \rightarrow a} (x^2 + a^2)(x + a)$$

$$\{2a^2\}(2a)$$

$$= 4a^3$$

$$\frac{(x^2 + a^2)(x^2 - a^2)}{x - a}$$

~~$$\frac{(x^2 + a^2)(x + a)(x - a)}{(x - a)}$$~~

Find the derivative using the power rule

D) $f(x) = 3 + x^2 - x^3 + x^5$

$$f'(x) = 0 + 2x - 3x^2 + 5x^4$$

E) $y = \frac{x^4}{5} + 3x^7$

$$y = \frac{1}{5}x^4 + 3x^7$$

$$y' = \frac{4}{5}x^3 + 21x^6$$

$$y = x^{-3}$$

$$y = \frac{1}{x^3}$$

$$\frac{1}{x} = x^{-1}$$

$$\sqrt{x} = x^{1/2}$$

F) $y = x^{-3}$

$$y = x^{-3}$$

$$\frac{dy}{dx} = -3x^{-4}$$

G) $y = \frac{x^{-5}}{3} + \frac{x^{-3}}{4} - \frac{1}{x}$

$$y = \frac{1}{3}x^{-5} + \frac{1}{4}x^{-3} - x^{-1}$$

$$y' = -\frac{5}{3}x^{-6} - \frac{3}{4}x^{-4} + x^{-2}$$

H) $f(x) = 4\sqrt{x} - \frac{1}{x} + \frac{2}{\sqrt{x}}$

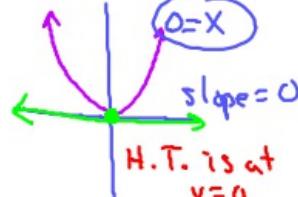
$$f(x) = 4x^{1/2} - x^{-1} + 2x^{-1/2}$$

$$f'(x) = 2x^{-1/2} + x^{-2} - 1x^{-3/2}$$

$$y = x^2$$

$$\frac{dy}{dx} = 2x$$

$$\frac{0}{2} = \frac{2x}{2}$$



I) $x^3 + 2x^2$

$$y = x^3 + 2x^2$$

$$\frac{dy}{dx} = 3x^2 + 4x$$

$$0 = 3x^2 + 4x$$

$$0 = x(3x + 4)$$

J) $\frac{2}{3}x^3 - \frac{5}{2}x^2 - 3x = y$

$$\frac{dy}{dx} = 2x^2 - 5x - 3$$

$$0 = 2x^2 - 5x - 3$$

$$0 = (2x + 1)(x - 3)$$

$$x = 0$$

$$3x + 4 = 0$$

$$x = -\frac{4}{3}$$

$$x = -\frac{1}{2}$$

$$x = 3$$