

Basic Differentiation Rules

w-up: AP Multiple Choice #13 and #16 (both non-calculator)

Basic Properties of Derivatives

$$\frac{dy}{dx} C f(x) = C \frac{dy}{dx} f(x) \text{ where } C \text{ is any constant.}$$

$$\frac{dy}{dx} [f(x) \pm g(x)] = \frac{dy}{dx} f(x) \pm \frac{dy}{dx} g(x)$$

BASIC RULES

If $f(x) = 5$ what is $f'(x)$?

$$\frac{dy}{dx} C = 0 \text{ where } C \text{ is any constant.}$$

If $f(x) = 5x$ what is $f'(x)$?

$$\frac{dy}{dx} Cx = C \text{ where } C \text{ is any constant}$$

Examine the list of functions and derivatives(found using the limit def'n of derivative) to develop a pattern!

$$f(x) = 5x^2$$

$$f'(x) = 10x$$

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

$$f'(x) = -6x^2$$

$$f(x) = 1/2 x^6$$

$$f'(x) = 3x^5$$

$$f(x) = -100x^9$$

$$f'(x) = -900x^8$$

The Power Rule (the BIGEEEEEEEE.....)

$$\frac{dy}{dx} x^n = nx^{n-1}$$

Note: can **only** be used for **singular powers** of x being added or subtracted together

Find the derivatives for each function

EX) $f(x) = x^3 - 2x^2 + 5x + 10$ EX) $f(x) = \frac{x^3 - 2x + 4}{x^2}$

EX) $f(x) = \frac{\sqrt{x}}{3} - 2x^2$ EX) $f(x) = (3x - 5)^2$

Horizontal Tangent Line: a tangent line drawn to a point where the slope is ZERO!

EX) Find the ordered pairs on the graph of $y = x^4 - 3x^2 + 2$ where horizontal tangent lines exist. NO CALCULATOR ALLOWED!

Derivatives of Sine and Cosine

$$\frac{dy}{dx} \sin x = \cos x$$

$$\frac{dy}{dx} \cos x = -\sin x$$

EX) Find the equation of the line drawn tangent to $y = -2 \sin x$ at $x = \frac{3\pi}{4}$.