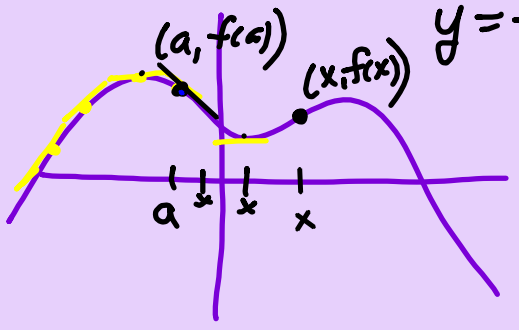
DERIVATIVES = the slope of a line tangent to a curve at a given point



$y = f(x)$

$$f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$$

let's x get really close to a

slope $\frac{(y_2 - y_1)}{x_2 - x_1}$

$f(x) = 3x^2+4x-5$ $\lim_{x\to a} \frac{f(x)-f(a)}{x-a}$

$f(x)$ $f(a)$

$$\lim_{x\to a} \frac{3x^2+4x-5+(-3a^2-4a+5)}{x-a} = \frac{0}{0}$$

$$\lim_{x\to a} \frac{3(x^2-a^2)+(4x-4a)}{x-a}$$

$$\lim_{x\to a} \frac{3(x-a)(x+a)+4(x-a)}{x-a}$$

$$\lim_{x\to a} 3(x+a)+4$$

$$= 3(a+a)+4$$

$$= \boxed{6a+4}$$

(b) $f(x) = \frac{1}{x^2}$

$$\lim_{x\to a} \frac{\frac{1}{x^2}-\frac{1}{a^2}}{x-a}$$

Make a common denom then factor.

$f(x)$	$f'(x)$
$3x^2 - 4x^1 - 5x^0$	$6x^1 - 4x^0$
$5x^3 - 4x^7$	$15x^2 - 28x^6$
$\frac{1}{x^2} = 1x^{-2}$	$-\frac{2}{x^3}$ $-2x^{-3}$

Power Rule

$$\frac{d}{dx} x^n = n \cdot x^{n-1}$$

all terms must be + or −

all terms in numerator

$$f(x) = 4x^8 + \frac{2}{x^3} - 4x + 7 - \sqrt[3]{x}$$

$$= 4x^8 + 2x^{-3} - 4x^1 + 7 - x^{1/3}$$

$$f'(x) = 32x^7 - 6x^{-4} - 4x^0 + 0 - \frac{1}{3}x^{-2/3}$$

$$= 32x^7 - \frac{6}{x^4} - 4 - \frac{1}{3x^{2/3}}$$

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

Foil First, then do Deriv