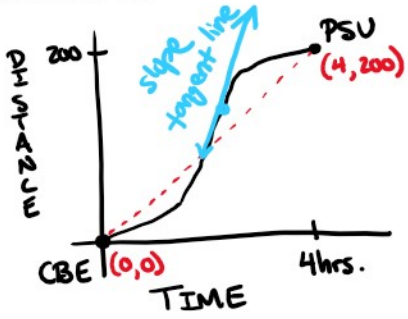
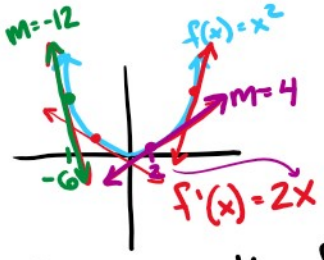
3.1 Intro to Derivatives

Wednesday, June 12, 2019 7:14 AM



Avg. Speed $= \frac{200}{4} = 50$mph



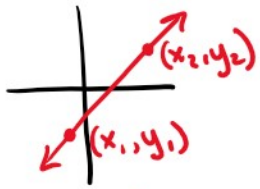
Derivative

Given a function $f(x)$, the derivative is written $f'(x)$ ("f prime of x") and represents the slopes of all tangent lines to the graph of $f(x)$.

$f(x) = 4x^2 - 5x + 2$ $\quad y = 4x^2 - 5x + 2$

$f'(x) = 8x - 5$ $\quad \frac{dy}{dx} = 8x - 5$

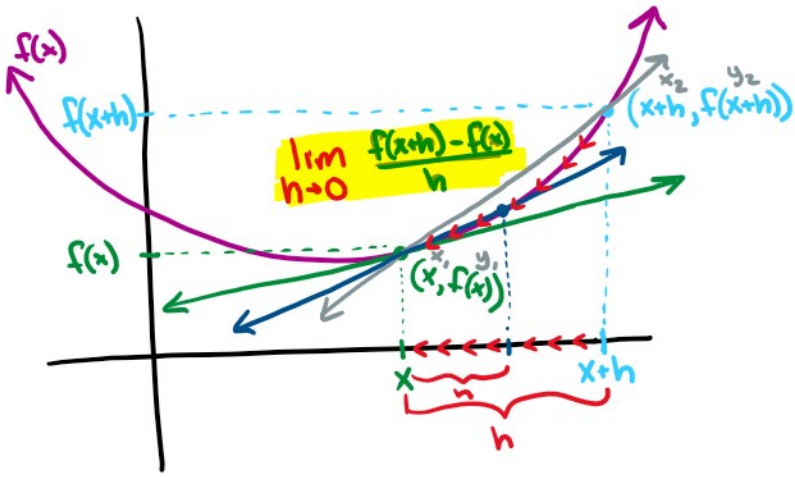
ALG2



$m = \frac{y_2 - y_1}{x_2 - x_1}$

PRE-CALC

Avg. Rate of Change $= \frac{f(x_2) - f(x_1)}{x_2 - x_1}$



ex $f(x) = (x^2 - 3x + 1)$

① $f(x+h) = (x+h)^2 - 3(x+h) + 1$ $\quad (x+h)(x+h)$

$x^2 + xh + hx + h^2 - 3x - 3h + 1$

$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

$= \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - 3x - 3h + 1 - (x^2 - 3x + 1)}{h}$ $\quad -x^2 + 3x - 1$

* all terms without h in them should cancel

$= \lim_{h \to 0} \frac{2xh + h^2 - 3h}{h}$ factor / cancel

$= \lim_{h \to 0} \frac{h(2x + h - 3)}{h}$

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

The Limit Definition of the Derivative (The Difference Quotient)

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

(Slopes of all tangent lines)