TOPIC: DERIVATIVES AS FUNCTIONS

Derivatives

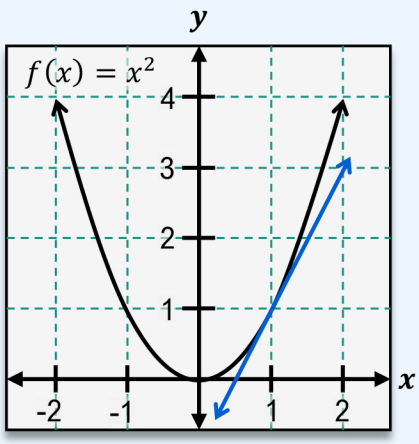
◆ Recall: **Derivative** is just the slope of the _____ line. Notations: $f'(x),\ y', \frac{dy}{dx}$
(instantaneous rate of change)

- To write the eq'n for the derivative of a function at *any* point on the curve, use the **Definition of the Derivative**:

EXAMPLE Find the derivative of $f(x) = x^2$ for ***any*** x. Use this to find the slope of the tangent line at $x = 1$ and $x = -2$.

Recall — Tangent Line

$$m_{\tan} = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$



$$m_{\tan} = \lim_{x \to 1} \frac{f(x) - f(1)}{x - 1}$$

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

$$= \lim_{x \to 1} \frac{(x+1)(x-1)}{x - 1}$$

$$= \lim_{x \to 1} x + 1$$

$$= 2$$

New — Derivatives

$$\_\_(x) = \lim_{h \to} \frac{f(\quad) - f(\quad)}{\quad}$$

$f(x) = x^2$

$f'(x) = \lim_{h \to 0}$ $\qquad f'(1) =$

$= \lim_{h \to 0}$

$= \lim_{h \to 0}$ $\qquad f'(-2) =$

$= \lim_{h \to 0}$

TOPIC: DERIVATIVES AS FUNCTIONS

PRACTICE Find the derivative of the function $f(x) = 4x^2 - 9x$.

PRACTICE Use the definition of a derivative to find the derivative of the function $g(x) = x^3$ at $x = -1$.