**3.1 Derivative of a Function**

## Definition of Derivative

alternate form

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

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

Notation for finding the derivative:

$f'(x),\ y',\ \dfrac{dy}{dx},\ \dfrac{d}{dx},\ \dfrac{df}{dx},\ \dfrac{d}{dx} f(x)$

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Ex 1)  Find f'(x) if f(x) = x² + 4 at x = 1.

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

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

Ex 2) Find y' for $f(x) = x^2 - 1$ at a = -2.

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

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

Ex 3) Find $\frac{dy}{dx}$ of $f(x) = \sqrt{(x + 2)}$.

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

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

Ex 4)  Use the definition of the derivative to find f'(1) for $f(x) = \dfrac{1}{x^2}$ .

Ex 5)  At what point is the tangent to $f(x) = x^2 + 4x - 1$ horizontal?

problem #29 from2.4