# DO NOW



## 3.1 Derivatives Introduction - Day 4

Alternative Limit Form of the derivative:

The derivative of $f$ at $c$ is given by:

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

provided the limit exists.

*Remember:

$\lim_{x \to c^-} \frac{f(x)-f(c)}{x-c}$ must equal $\lim_{x \to c^+} \frac{f(x)-f(c)}{x-c}$

*If these one-sided limits are not equal, the derivative does not exist at that point.



Example: Use the alternative form of the derivative to find the derivative at $x = c$ (if it exists).

$f(x) = x^3 + 2x, \quad c = 1$

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

$$\lim_{x \to 1} \frac{(x^3+2x) - (1^3+2(1))}{x-1}$$

$$\lim_{x \to 1} \frac{x^3+2x-3}{x-1}$$

$$\lim_{x \to 1} \frac{(x-1)(x^2+x+3)}{x-1}$$

$$\lim_{x \to 1} (x^2+x+3)$$

$$1^2+1+3$$

$$5$$



Example: Use the alternative form of the derivative to find the derivative at $x = c$ (if it exists).

$f(x) = (x+3)^{1/3}, \quad c = -3$

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

$$\lim_{x \to -3} \frac{(x+3)^{1/3} - (-3+3)^{1/3}}{x+3}$$

$$\lim_{x \to -3} \frac{(x+3)^{1/3}}{x+3}$$

$$\lim_{x \to -3} \frac{1}{(x+3)^{2/3}}$$

D.N.E.



# HOMEWORK

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