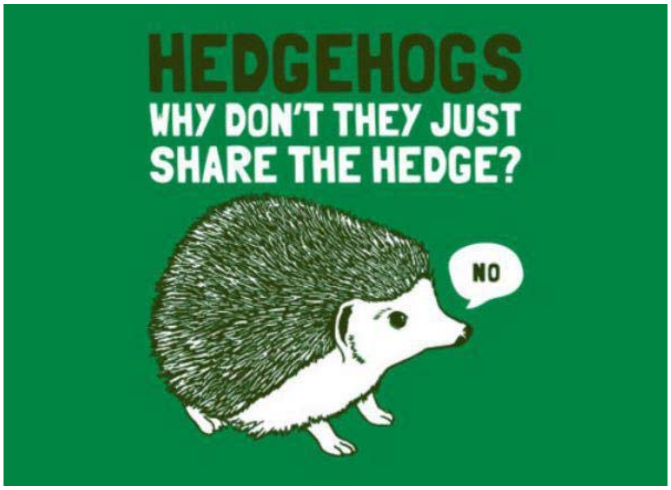


Tuesday, September 6, 2016

- New Seats
- New Calendar Chapter 3 - Derivatives
- Opener Graphs - Graph Slope
- 3.1 - Notes - 2 Definitions of Derivatives

3.1 Definition(s) of Derivative

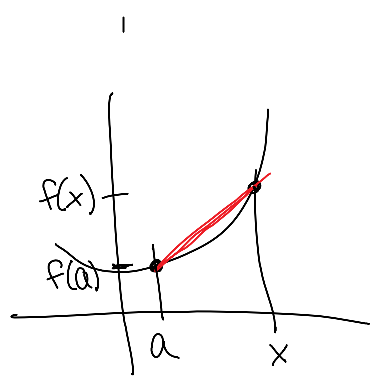
Derivative = slope of a curve at a point (pt of tangency)
= Instantaneous Rate of Change (IROC)

$$\boxed{f'(x) = f' = y' = \frac{dy}{dx} = \frac{d}{dx} f(x)}$$

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

at point $x=a$: $$\boxed{f'(a) = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}}$$

OR 2nd Def: $$\boxed{f'(a) = \lim_{x\to a} \frac{f(x) - f(a)}{x-a}}$$



Examples

① $f(x) = \frac{3}{x}$ find Derivative at $x=2$

* Use 2nd def: $f'(2) = \lim_{x\to 2} \frac{f(x) - f(2)}{x-2}$

$$= \lim_{x\to 2} \frac{\frac{3}{x} - \frac{3}{2} \cdot 2x}{x-2 \cdot 2x}$$

$$= \lim \frac{6 - 3x}{\quad}$$

$$= \lim_{x \to 2} \frac{6 - 3x}{(x-2)(2x)}$$

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

$$= \lim_{x \to 2} \frac{-3}{2x} = \frac{-3}{2(2)} = \boxed{-\frac{3}{4}}$$

(2) Find $f'(x)$ for $f(x) = \frac{3}{x}$.

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

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

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

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

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

$$f(x) = \frac{3}{x} \qquad f'(x) = \frac{-3}{x^2}$$