# Day 2

# Limit Definition of Derivatives

The Algebra Behind Derivatives

# Warm Up:

Given the function $f(x) = x^2 + 7$:

**Find:**

1. **$f(x + 3)=$**
2. **$f(x + h) =$**
3. $\lim_{h \to 0} \dfrac{f(x + h) - f(x)}{h}$

4. $\dfrac{x}{3} + \dfrac{2x}{4}$

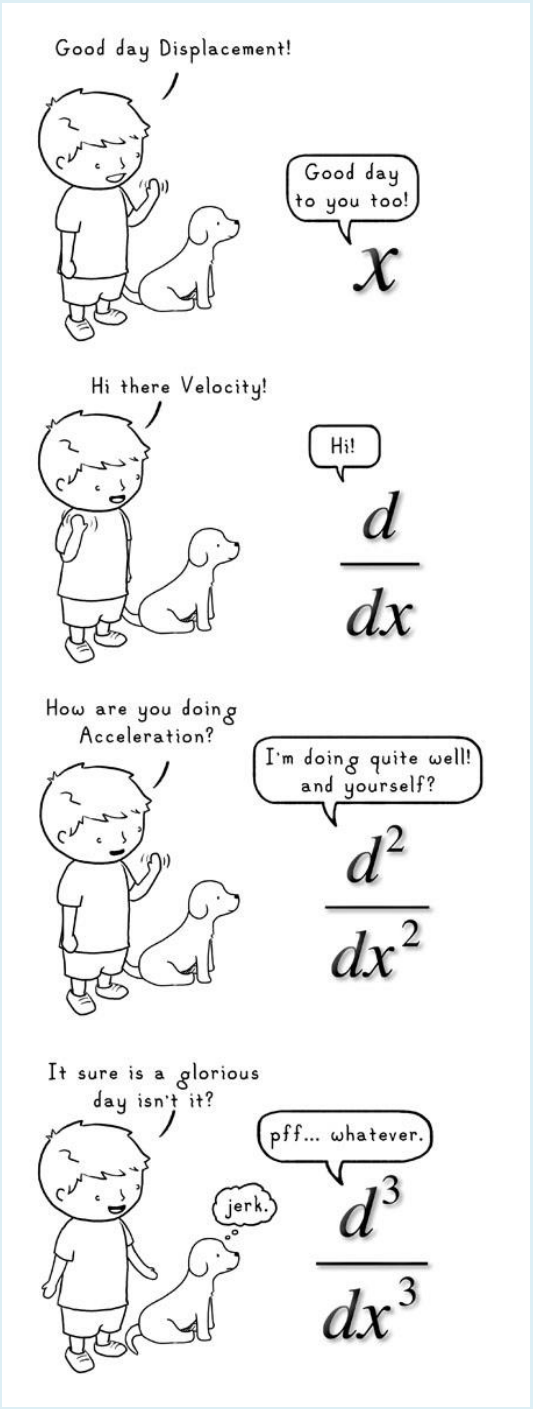
5. $\dfrac{3}{x} + \dfrac{4}{x-2}$

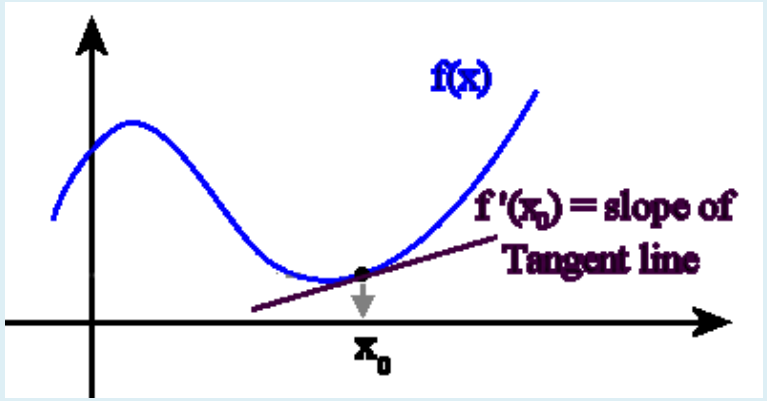
# Warm Up ANSWERS:

Given the function $f(x) = x^2 + 7$, find:

1. $f(x + 3) = x^2 + 6x + 16$
2. $f(x + h) = x^2 + 2hx + h^2$
3. $\lim_{h \to 0} \frac{f(x + h) - f(x)}{h} = 2x$
4. $\frac{x}{3} + \frac{2x}{4} = \frac{4x}{12} + \frac{6x}{12} = \frac{10x}{12} = \frac{5x}{6}$
5. $\frac{3}{x} + \frac{4}{x-2} = \frac{3(x-2)}{x(x-2)} + \frac{4x}{x(x-2)} = \frac{7x-6}{x(x-2)} = \frac{7x-6}{x^2-2x}$

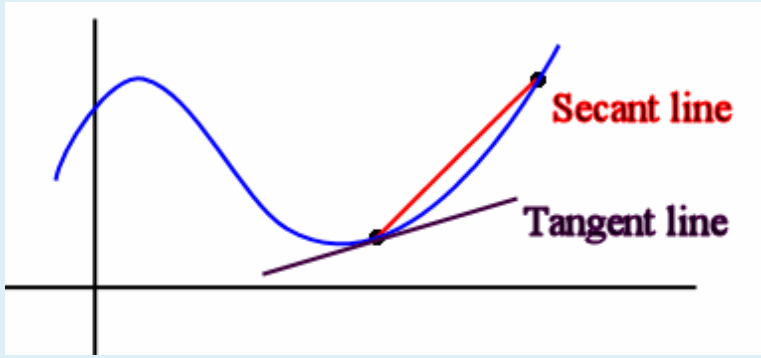
# HW Questions???




# Notes on Derivatives

## A Summary



# Limit Definition of Derivative

- Remember that :

$$\frac{f(x+h)-f(x)}{x+h-x} = \frac{f(x+h)-f(x)}{h}$$

for h values approaching 0.

- Since we cannot let h = 0, we find the $\lim_{h\to 0}$ .
- Thus, the limit definition of a derivative is

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

## Example 3:

# Evaluate the derivative using the limit definition of derivatives.

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

- Function: $f(x)=\sqrt{x-2}$

For Square Root problems, you must use the conjugate!

$$=\frac{1}{2\sqrt{x-2}}$$

# Practice…

- Find the derivative of the following using the limit definition of derivative.

$$f(x) = \sqrt{x+4}$$

$$= \frac{1}{2\sqrt{x+4}}$$

## Example 4:

# Evaluate the derivative using the limit definition of derivatives.

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

- Function: $f(x)=\dfrac{1}{x+1}$

$$=\frac{-1}{x^2+2x+1}$$

# Practice…

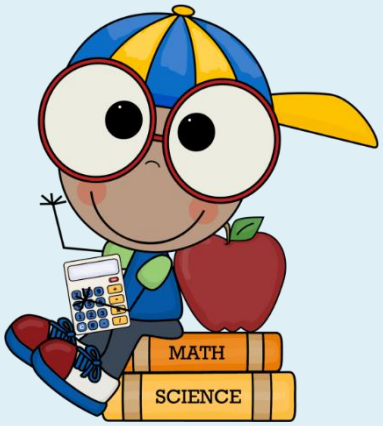
- Find the derivative of the following using the limit definition of derivative.

$$f(x) = \frac{1}{x-3}$$

$$= \frac{-1}{x^2 - 6x + 9}$$

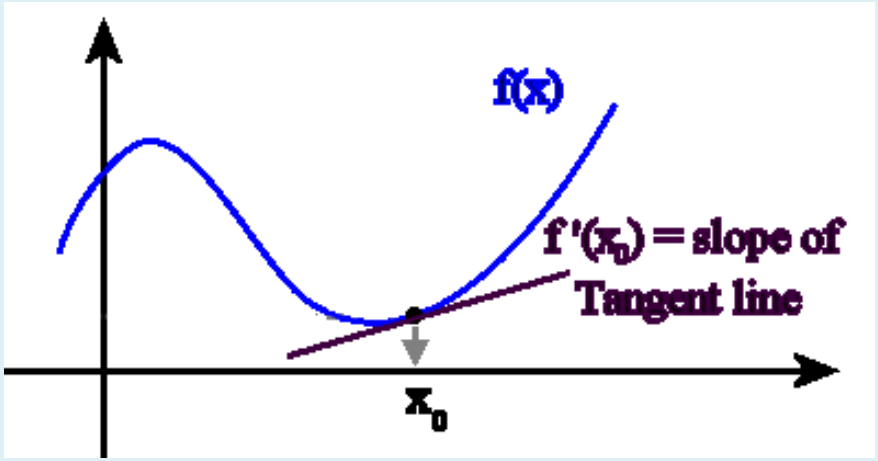
# Homework

- Finish Classwork p. 2
- Definition of Derivative p. 3



# Next slides…

- Skipped for Fall ’18…did a different method of derivative discovery for this semester




# Derivatives Discovery with TI-83/84 #1-7, 11-18