

Day 2

Limit Definition of Derivatives

The Algebra Behind Derivatives

A decorative graphic consisting of several horizontal lines of varying lengths and colors (light blue and white) extending from the right side of the slide towards the center.

Warm Up:

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

Find:

1. $f(x + 3) =$

2. $f(x + h) =$

3. $\lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$

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

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

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. $\lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h} = 2x$

4. $\frac{x}{3} + \frac{2x}{4} = \frac{4x}{12} + \frac{6x}{12} = \frac{10x}{12} = \frac{5x}{6}$

5. $\frac{3}{x} + \frac{4}{x-2} = \frac{3(x-2)}{x(x-2)} + \frac{4x}{x(x-2)} = \frac{7x-6}{x(x-2)} = \frac{7x-6}{x^2-2x}$

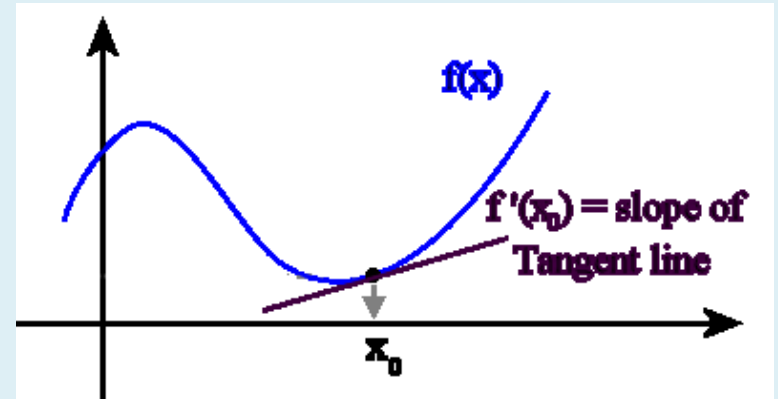
HW Questions???

Good day Displacement!



Good day to you too!

$$x$$



Hi there Velocity!



Hi!

$$\frac{d}{dx}$$

Notes on Derivatives

How are you doing Acceleration?



I'm doing quite well!
and yourself?

$$\frac{d^2}{dx^2}$$

A Summary

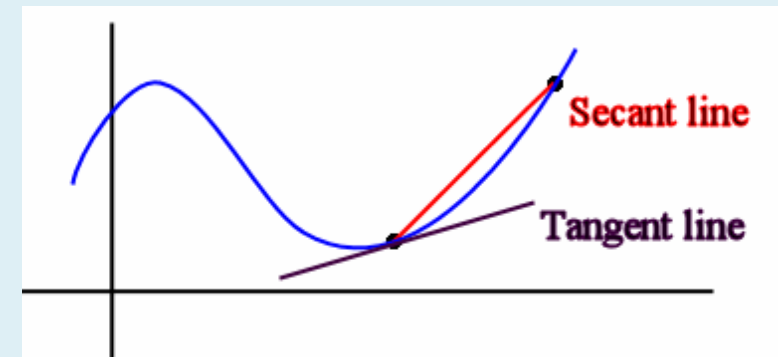
It sure is a glorious day isn't it?



pff... whatever.

jerk.

$$\frac{d^3}{dx^3}$$



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 $\lim_{h \rightarrow 0}$.
- Thus, the limit definition of a derivative is

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

Example 3:

Evaluate the derivative using the limit definition of derivatives.

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

- 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.

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

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

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

Practice...

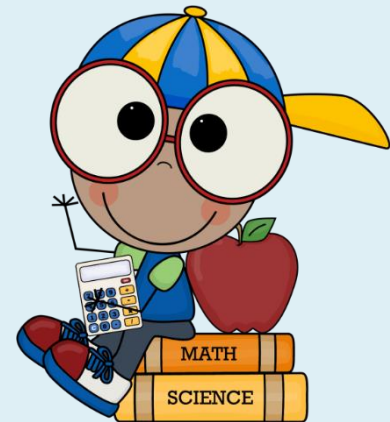
- Find the derivative of the following using the limit definition of derivative.

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

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

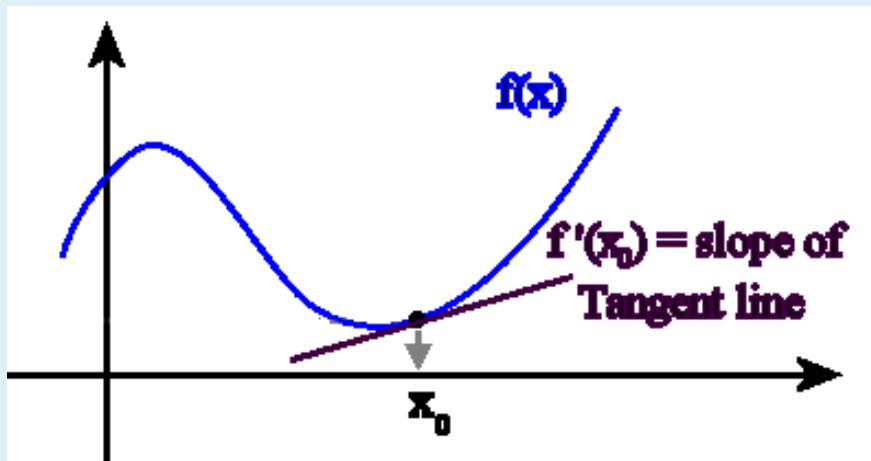
Homework

- 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

