DO NOW

Read page 116
The Tangent Line Problem

3.1 Derivative Introduction

What is a derivative???

Derivative: Slope of the tangent line to a graph $f(x)$ usually denoted by $f'(x)$ ← "f prime of x"

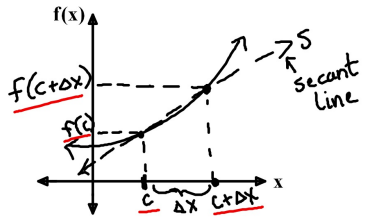
Other notations:

$\frac{dy}{dx}$ ← "derivative of y with respect to x"

y', $\frac{d}{dx}[f(x)]$, $D_x[y]$

Secant Line: (s)

** Average rate of change



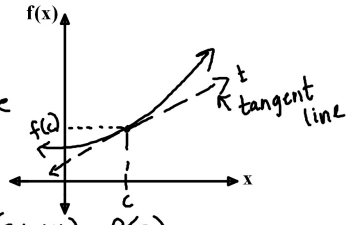
Slope of secant line:

$$m_{secant} = \frac{f(c+\Delta x)-f(c)}{(c+\Delta x)-c}$$

$$M_{secant} = \frac{f(c+\Delta x)-f(c)}{\Delta x}$$

Tangent Line: (t)

*** Instantaneous rate of change



Slope of Tangent Line:

$$m_{tangent} = \lim_{\Delta x \to 0} \frac{f(c+\Delta x)-f(c)}{\Delta x}$$

* "slope of the graph f at x=c."

Definition of the derivative:

The derivative of function f at x is given by

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

provided the limit exists.

For all x for which the limit exists, f' is a function of x.

Examples:

1. $f(x) = 2x - 6$

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

$$\lim_{\Delta x \to 0} \frac{2(x+\Delta x)-6-(2x-6)}{\Delta x}$$

$$\lim_{\Delta x \to 0} \frac{2x+2\Delta x-6-2x+6}{\Delta x}$$

$$\lim_{\Delta x \to 0} \frac{2\Delta x}{\Delta x}$$

$$\boxed{2}$$

2. $f(x) = x^2 - 6x + 11$

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

$$\lim_{\Delta x \to 0} \frac{(x+\Delta x)^2 - 6(x+\Delta x) + 11 - (x^2 - 6x + 11)}{\Delta x}$$

$$\lim_{\Delta x \to 0} \frac{x^2 + 2x\Delta x + (\Delta x)^2 - 6x - 6\Delta x + 11 - x^2 + 6x - 11}{\Delta x}$$

$$\lim_{\Delta x \to 0} \frac{2x\Delta x + (\Delta x)^2 - 6\Delta x}{\Delta x}$$

$$\lim_{\Delta x \to 0} 2x + \Delta x - 6$$

$$\boxed{2x - 6}$$

HOMEWORK

pg 123 - 124; 1 - 3, 11 - 21 odd