Suggested HW pdf is on D2L
List of problems is on page 3.
Full solutions on website
www.leahhoward.com

Quiz Wed Sept 13
Section 23.1

Quick Ex:

$f(x) = x^2 - 8x$

$f(1) = -7$

$f(y) = y^2 - 8y$

$f(3+h) = (3+h)^2 - 8(3+h)$

$f(x+h) = (x+h)^2 - 8(x+h)$

23.2 Slope of a Tangent Line Cont'd

Ex: Find m_{tan} to $y = x^2 + 4x$

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

$$= \lim_{h \to 0} \frac{(x+h)^2 + 4(x+h) - [x^2+4x]}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{x^2} + 2xh + h^2 + \cancel{4x} + 4h - \cancel{x^2} - \cancel{4x}}{h}$$

$$= \lim_{h \to 0} \frac{2xh + h^2 + 4h}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(2x + h + 4)}{\cancel{h}}$$

$$= \quad 2x + 4$$

Follow-Up:

At $x = 0$ $\quad m_{tan} = 4$

$x = -1$ $\quad m_{tan} = 2$

$x = 7$ $\quad m_{tan} = 18$

<u>Ex</u>: Find m_{tan} to $y = 2x^2 - 6x + 3$

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

$$= \lim_{h \to 0} \frac{2(x+h)^2 - 6(x+h) + 3 - [2x^2 - 6x + 3]}{h}$$

$$= \lim_{h \to 0} \frac{2(x^2 + 2xh + h^2) \cancel{- 6x} - 6h \cancel{+ 3} - 2x^2 \cancel{+ 6x} \cancel{- 3}}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{2x^2} + 4xh + 2h^2 - 6h \cancel{- 2x^2}}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(4x + 2h - 6)}{\cancel{h}}$$

$$= 4x - 6$$

23.3 The Derivative

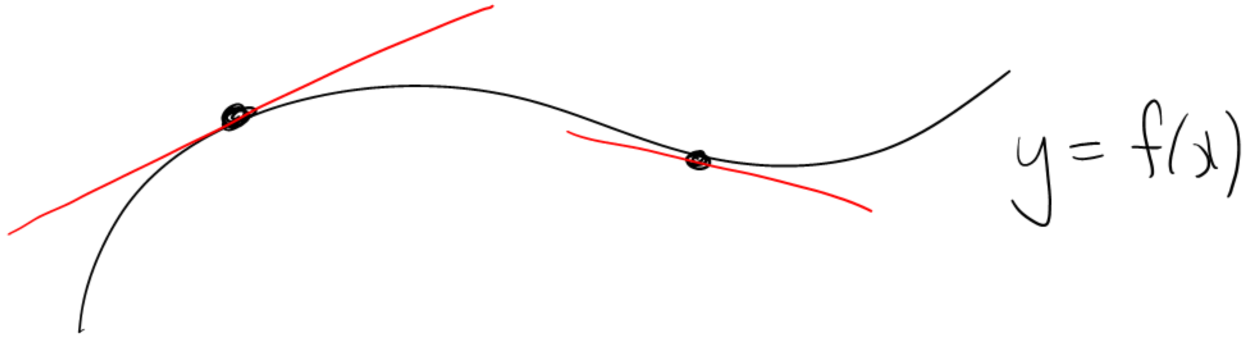
The derivative of $f(x)$ is written $f'(x)$.

$f'(x)$ represents :

slope of the tangent line

AND

instantaneous rate of change of $f(x)$



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

<u>Ex:</u> $f(x) = 2x^3 - \pi$

Find $f'(x)$ and $f'(-1)$.

Hint $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

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

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

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

$$= \lim_{h \to 0} \frac{\cancel{2x^3} + 6x^2h + 6xh^2 + 2h^3 - \cancel{2x^3}}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(6x^2 + 6xh + 2h^2)}{\cancel{h}}$$

$$= 6x^2$$

$$f'(x) = 6x^2$$

$$f'(-1) = 6$$