# 2.4 Day 2

Monday, September 22, 2014    9:44 PM

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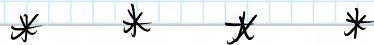
AP Calculus AB                    Name __Dimaro__
Notes 2.4 Day 2

Example 1:

a. At what point is the slope of the tangent line to $y = x^2 - 2x + 1$ equal to 0.5?

$$m = \lim_{h \to 0} \frac{(a+h)^2 - 2(a+h) + 1 - (a^2 - 2a + 1)}{h} = \lim_{h \to 0} \frac{a^2 + 2ah + h^2 - 2a - 2h + 1 - a^2 + 2a - 1}{h}$$

$$= \lim_{h \to 0} \frac{2ah + h^2 - 2h}{h} = \lim_{h \to 0} 2a + h - 2 = 2a - 2$$

$$m = .5 = 2a - 2 \quad a = 1.25 \quad \boxed{(1.25, .0625)}$$

b. Write the equation of the tangent line using the point from part a.

$$y - .0625 = .5(x - 1.25)$$

OR

$$y - \frac{1}{16} = \frac{1}{2}\left(x - \frac{5}{4}\right)$$

c. Write the equation of the normal line to the tangent line from part b.

$$y - .0625 = -2(x - 1.25)$$

Example 2:

A rock breaks loose from the top of a tall cliff.  ($f(t) = 16t^2$)
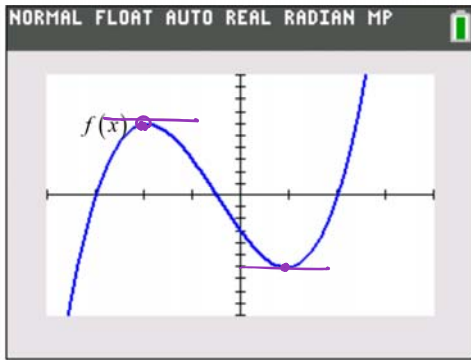
a. Find the average speed between t=0 and t=2 secs.

$$avg = \frac{16(2)^2 - 16(0)^2}{2 - 0} = \frac{64 - 0}{2} = \boxed{32 \text{ ft}/\text{sec}}$$

b. Find the speed at t=3 secs.

$$m = \lim_{h \to 0} \frac{16(3+h)^2 - 16(3)^2}{h} = \lim_{h \to 0} \frac{16(9 + 6h + h^2) - 16(9)}{h} = \lim_{h \to 0} \frac{16(6h + h^2)}{h}$$

$$= \lim_{h \to 0} 16(6 + h) = 16(6) = \boxed{96 \text{ ft}/\text{sec}}$$

Example 3:

NORMAL FLOAT AUTO REAL RADIAN MP

$f(x)$

Where would the $f(x)$ have a slope of zero?

max and min

Draw the tangent lines on the graph that have a slope of zero.

Example 4: At what **point** is the tangent to $f(x) = 3 - 4x - x^2$ horizontal?

max (vertex)

$$\lim_{h \to 0} \frac{3 - 4(a+h) - (a+h)^2 - (3 - 4a - a^2)}{h}$$

$$= \lim_{h \to 0} \frac{-4a - 4h - a^2 - 2ah - h^2 + 4a + a^2}{h}$$

$$= \lim_{h \to 0} -4 - 2a - h = -4 - 2a$$

$$m = 0 = -4 - 2a$$
$$4 = -2a$$
$$-2 = a$$

Point $(-2, 7)$

Check: vertex $h = \frac{-b}{2a} = \frac{4}{2(-1)} = -2 \checkmark$

$$k = 7 \checkmark \qquad (-2, 7)$$