

# Solutions to Quiz # 1

The Oregon Duck

February 6, 2009



*Hi college football fans!!! After Corey's rant in class yesterday about the University of Florida and their football program, I thought I'd step in and write the solutions to the quiz you just took. Enjoy!*

1. (a) The slope is  $(5-2)/(2-1) = 3$ . (b) The slope is  $(3.25-2)/(1.5-1) = 1.25/.5 = 2.5$ . (c) The slope is  $(2.21 - 2)/(1.1 - 1) = .21/.1 = 2.1$ . (d) Based on these answers, it seems that the slope of the tangent line at  $x = 2$  is 2.
2. Let  $\epsilon > 0$  be given. Then  $|(4x + 1) - 9| = |4x - 8| = 4|x - 2| < 4\delta = \epsilon$ . Therefore, we set  $\delta = \epsilon/4$ .
3. According to the graph: (a) 1.75 (or anything relatively close to that), (b) Does not exist.
4. (a)

$$\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4} = \lim_{x \rightarrow 4} \frac{(x + 4)(x - 4)}{x - 4} = \lim_{x \rightarrow 4} x + 4 = 8.$$

(b)

$$\lim_{x \rightarrow 1} \sin(x^2 - 1 + \pi) = \sin\left(\lim_{x \rightarrow 1} x^2 - 1 + \pi\right) = \sin \pi = 0.$$

5. First, we compute

$$f(x + \Delta x) = 2(x + \Delta x)^2 - 1 = 2(x^2 + 2x\Delta x + (\Delta x)^2) - 1 = 2x^2 + 4x\Delta x + 2(\Delta x)^2 - 1.$$

Then:

$$f(x + \Delta x) - f(x) = 2x^2 + 4x\Delta x + 2(\Delta x)^2 - 1 - (2x^2 - 1) = 4x\Delta x + 2(\Delta x)^2.$$

Thirdly:

$$\frac{f(x + \Delta x) - f(x)}{\Delta x} = \frac{4x\Delta x + 2(\Delta x)^2}{\Delta x} = 4x + 2\Delta x.$$

Now finally, as  $\Delta x \rightarrow 0$ :

$$\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} = \lim_{\Delta x \rightarrow 0} 4x + 2\Delta x = 4x.$$