ESP Math 179 **Fall 2015**

Worksheet 19

29 October 2015

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1. **Warm up:** Answer the following questions with True / False.

   (a) If $f(x)$ is a linear function, then the linear approximation of f at any point is f itself.

   (b) The linear approximation to x^2 at $x = 0$ is $y = 0$.

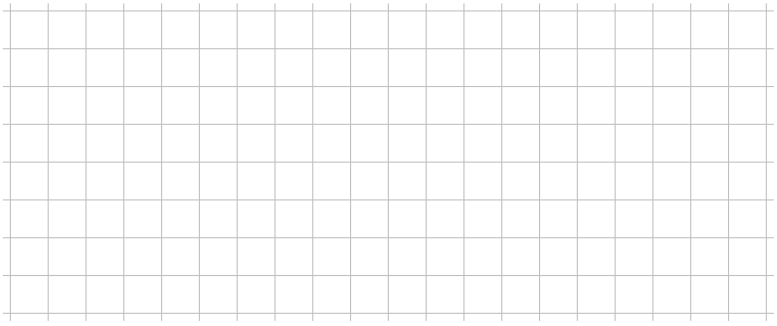
   (c) The linear approximation to f at a point a for which $f'(a) = 0$ is $y = 0$.

   (d) For a positive function f, minimizing / maximizing $f(x)$ is the same as minimizing / maximizing $f^2(x)$.

2. Consider the function $f(x) = \cos(x)$.

   (a) Give the linearization of f at $x = \theta$ and $x = \theta + 2\pi$.

   (b) Draw $f(x)$ and the two linearizations for $\theta = \pi/6$ on $0 \leqslant x \leqslant 4\pi$.

   (c) What is the difference in the y-intercepts of the two linearizations from part (a)?

   (d) What does this say about the slope of f?

3. Consider the function $f(x) = \sqrt{x}$.

(a) Find the point (x, y) on the graph of f nearest to $(4, 0)$. *Hint: Recall 1.(d) above.*

(b) Find the linear approximation to f at this point.

(c) Find the equation of the line through this point and $(4, 0)$.

(d) What do you notice about the slopes of the lines you found in parts (b) and (c)?