Math 131 - October 15, 2014
Solutions

Warm-up Problems

1. Let $f(x) = x^2 + x$ and let $g(x) = 3(x-1) + 2$.
   (a) At $x = 1$, does the graph of f have positive or negative slope?
   (b) At $x = 1$, does the graph of g have positive or negative slope?
   (c) Find an approximation $f(1.1) \approx 2.31$
   (d) Find an approximation $g(1.1) \approx 2.3$
   (e) Explain the relationship between $f(x)$ and $g(x)$.

2. (More complicated version of previous problem)
   Let $f(x) = \frac{\cos\left(\frac{1}{6}\pi x\right)\log(x)}{x^2+x+1}$ and let $g(x) = \frac{1}{6}\sqrt{3}(x-1)$.
   (a) At $x = 1$, does the graph of f have positive or negative slope?
   (b) At $x = 1$, does the graph of g have positive or negative slope?
   (c) Find an approximation $f(1.1) \approx 0.241491971684$
   (d) Find an approximation $g(1.1) \approx 0.288675134595$
   (e) Explain the relationship between $f(x)$ and $g(x)$.

Lecture Problems

3. Linearize the functions at the given points.
   (a) $f(x) = x^2 + x$, at $x = 1$
   Solution: $L(x) = 2 + 3(x-1)$
   (b) $f(x) = \sqrt{x}$, at $x = 64$
   Solution: $L(x) = 8 + 1/16(x-64)$
   (c) $f(x) = \cos(x)$, at $x = \frac{1}{6}\pi$
   Solution: $L(x) = \frac{1}{2}\sqrt{3} + -\frac{1}{2}(x - \frac{1}{6}\pi)$
   (d) $f(x) = -x^2 + 12$, at $x = 2$
   Solution: $L(x) = 8 + -4(x-2)$
   (e) $f(x) = \log(x+1)$, at $x = 0$
   Solution: $L(x) = 0 + 1(x-0)$
   (f) $f(x) = \frac{x}{x+1}$, at $x = 1$
   Solution: $L(x) = \frac{1}{2} + \frac{1}{4}(x-1)$

4. Test Oct 22! Covers Sections 3.1-3.11:
   (a) Derivatives and Tangents. Limit definition.
   (b) Differentiation Rules and Formulas. All of them.
   (c) Implicit differentiation.
   (d) Derivatives of inverse functions.
   (e) Related Rates.
   (f) Linearizations.