Math 31B — Homework 02

Thursday Quiz Date: October 10, 2013
Tuesday Quiz Date: October 15, 2013

PART 1: Compound Interest + Inverse Functions

1. 7.5: 3
2. 7.5: 15 (you will need to look up the formula for PV)
3. 7.2: 2
4. 7.2: 21, 22
5. (a) Explain why the function $f(x) = x^5 + x$ has an inverse function defined on all the real numbers.
   (b) Let $g(x)$ be the inverse function of $f(x)$. Find an equation for the line tangent to $g(x)$ at $x = 2$.

PART 2: L'hôpital's Rule

6. 7.7: 13, 39, 25, 55
7. (a) Let $a > 0$. Compute
$$\lim_{x \to 0^+} \frac{\ln(x)}{x^a}$$
   (b) Let $A > 0$. compute
$$\lim_{x \to \infty} \frac{x^A}{e^x}$$
   (c) Let $a > 0$, compute
$$\lim_{x \to 0^+} x^a \ln(x)$$
8. Compute the following limits
   (a)
$$\lim_{x \to 0} \frac{e^x - 1}{x}$$
   (b)
$$\lim_{x \to 0} \frac{e^x - 1 - x}{x^2}$$
   (c)
$$\lim_{x \to 0} \frac{e^x - 1 - x - \frac{1}{2}x^2}{x^3}$$
   (d)
$$\lim_{x \to 0} \frac{e^x - 1 - x - \frac{1}{2}x^2 - \frac{1}{2 \cdot 3}x^3}{x^4}$$

PART 3: Models Involving Exponentials

1. 7.4: 12
2. 7.4: 25
3. 7.6: 9
4. 7.6: 16 (See page 378 example 2 for a formula. Hint: Look at the table on page 380 in the summary. Our equation has the form $v' = -A(v - B)$ where $A = k/m$ and $B = -mg/k$. Think about what role A plays in the solution and what happens to A when m gets really really big.)