Imaginary Quiz (as discussed in class, this is not worth any marks. You won't be handing this in. Solutions will be posted tonight. This is longer than a standard quiz)

Imaginary Quiz

1. For each of the following, determine all critical points and whether the point represents a local maximum, a local minimum, or neither.
   a. $y = 8 - \sqrt{x^2 + 12x + 45}$
   b. $y = (2x - 8)^{\frac{1}{3}}$
2. For the following function, determine the equations of all asymptotes and the coordinates of all points that are either a local maximum or a local minimum

$$y = \frac{x - 5}{x^2 - 9}$$

3. Determine the equations of any asymptotes and the locations of any holes, including the y-coordinate of the hole, for the following

$$y = \frac{x^3 - 3x^2 + 6x}{2x^2 - 2x}$$

4. The equation $y = ax^3 + 12x^2 + 36x + b$ has a critical point at (3, 125). Determine the value of $a$ and $b$.
5. Determine the intervals of concavity (i.e., the intervals over which the function is concave up or concave down) for the function $y = 3x^5 - 10x^3 + 15$
6. Graph a curve that meets the following conditions (everyone's answer for this could be slightly different)
   - $f'(x) > 0$ over the interval $x \in (-5,2) \cup (8,\infty)$
   - $f'(x) < 0$ over the interval $x \in (-\infty,-5) \cup (2,8)$
   - $f''(x) > 0$ over the interval $x \in (-\infty,-2) \cup (5,\infty)$
   - $f''(x) < 0$ over the interval $x \in (-2,5)$

The stuff on Friday's test includes everything that we have done in the handouts labeled 4.010 to 4.050. That includes all of the homework assigned after we went through those questions in class. Some of the topics include:

- Determining intervals of increase and decrease
- Using the first derivative test to see if a critical point is a local maximum or a local minimum or neither
- determining equations of asymptotes and locations of holes (including y-coordinate of hole)
- determining intervals of concavity, using the second derivative test to see if a point is a maximum or a minimum or neither
- determining points of inflection (which means that the second derivative is equal to zero at a point or is undefined at that point)
- graph a curve given certain information about the curve
- graph y = f(x) given a graph of y = f'(x) or graphing y = f'(x) given a graph of y = f(x)
- using the algorithm for curve sketching to graph wonderful curves when I give you the function equation (two or three of these will be on your test) – you should know ahead of time all of the stuff that you're expected to find even if it's not listed in a question, with the understanding that sometimes the question will give you the first or second derivative and sometimes you will be told that for a particular question, you can skip a particular part of the analysis
- you could get a couple or a few multiple choice questions for this unit.

If you are done everything so far and are looking for some extra work, then some extra work that you could do is the following (answers are on twitter):

- page 205 number 3
- page 213 number 9
- page 216 number 4, 6, 12a, 13, 14
- page 220 number 5, 7