Calculus I, 21-111
Review problems for the first test
February 13

1. Solve the equation $x^3 - 6x^2 + 4x = 0$.

2. Simplify so that your does not involve parentheses or negative exponents:

$$\frac{\left(8x^2y\right)^{\frac{2}{3}}}{\left(xy^{-2}\right)^{-1}}$$

3. Consider the functions $f(x) = \frac{x}{2+x}$ and $g(x) = \frac{4}{x}$. Calculate and simplify each of the following:

   (a) $f(g(x))$

   (b) $f(x) + g(x)$

4. Find the derivative of the function $f(x) = x^2 + 5x$ directly from the definition.

5. Determine the equation of the tangent line to the graph of $f(x) = 2x^2+3x$ where $x = 1$ and express it in the form $y = mx + b$.

6. Determine the equation of the line parallel to the line $3x + 5y = 6$ and passing through $(-2, 4)$. Express it in the form $Ax + By = C$ and draw its graph.

7. The height in feet of a ball is given by $s(t) = -16t^2 + 48t + 64$ after t seconds. Answer each of the following:

   (a) What is the ball's intial height?

   (b) What is the ball's initial velocity?

   (c) When will the ball hit the ground?

   (d) How fast will the ball be travelling when it hits the ground?

   (e) When will the ball be at its highest point?

   (f) How high will the ball be at its highest point?

8. Sketch the graph of $y = x^3+6x^2$, and label any intercepts, local maximums or minimums, and points of inflection.

9. Determine the absolute maximum and absolute minimum of the function $f(x) = x^3 + 3x^2 + 5$ on the interval $-2 \leq x \leq 2$. Indicate briefly how you know that the points you indicate are the maximum and the minimum.