235 TEST 2.

You may use your notebook during the last half hour of this exam.
You may NOT use calculators, cell phones, or peeking.

Math 235
November 4, 2010 **Name:** _____

1. Given the properties below, sketch a possible graph of f, and state whether or not f is continuous and/or differentiable at $x = 1$. What about from the left and the right?

$$f(1) = 3, \ \lim_{x \to 1^-} f(x) = 3, \ \lim_{x \to 1^+} f(x) = 3, \ \lim_{h \to 0^-} \frac{f(1+h)-f(1)}{h} = 2, \text{ and } \lim_{h \to 0^+} \frac{f(1+h)-f(1)}{h} = 0.$$

2. Use the quotient rule and the derivative of cosine to prove that $\frac{d}{dx}(\sec x) = \sec x \tan x$.

3. The graph shown on the right is the derivative f' of some mystery function f. Sketch a possible graph of f on the axes to the left. Label all roots, extrema, and inflection points with dots, and be sure that your x-values line up correctly.
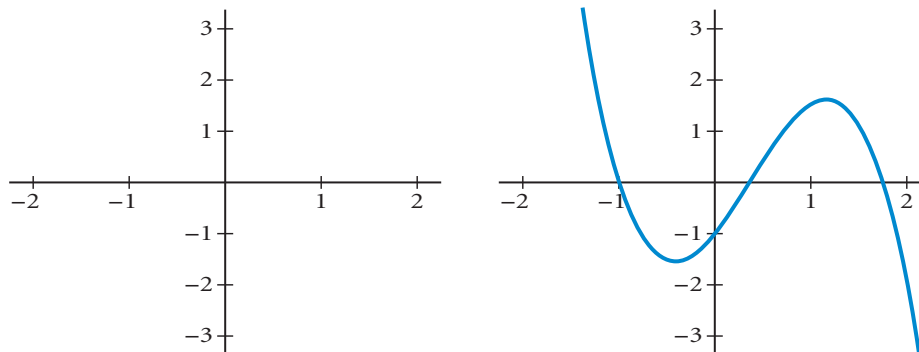
4. Calculations! Justify each answer by showing all work. Partial justifications will only be worth partial credit.

a) Find the inflection points, if any, of $f(x) = x^4 - 4x^3 + 6x^2$.

b) Find the global maximum, if any, of $f(x) = \dfrac{x^2}{x-2}$.

c) Find a function $f(x)$ whose derivative is $f'(x) = x^2\sqrt{1+x^3}$. You may have to "guess and check" to find such a function.

d) Find the value of $\lim\limits_{x \to 0^+} x^x$.

5. Linda is bored and decides to pour an entire container of salt into a pile on the kitchen floor. She pours 3 cubic inches of salt per second into a conical pile whose height is always two-thirds of its radius. How fast is the radius of the conical salt pile changing at the instant that the height of the pile is 4 inches?

show all work clearly please, not in a jumbled mess :)

Survey for 2 bonus points: How did you do? Were you prepared for the sorts of questions that were on this exam?

Survey for 2 more bonus points, woo! What is a question or topic that could have been on this exam, but wasn't?