Math 3C Warming up for Differential Equations

In order to make sure there is a level playing field, please do the problems below and turn them in by the first day of class. They will not be graded but we will give you feedback on them so that you will know whether or not you should go to CLAS, Math Lab, or a review session with us. Also we hope that you will be able to tell by doing them on your own what areas you may need to review.

Material from 3A

1. Suppose $f(3) = 5$, $f'(3) = 2$. Give an approximation of $f(3.1)$.

2. Suppose $f(x) = \frac{1}{x}$. Use the definition of derivative to find the derivative of f at x. How many derivatives of this function are there?

3. At noon, a cup of coffee is at 100 degrees. It slowly cools to room temperature by 12:20. At 12:30 it is reheated for about three minutes. Finally, at 12:40, I put it in the fridge. Draw a graph representing this with temperature on the y-axis and the time on the x-axis. Draw a graph representing the rate of change of temperature. Though answers will vary, you should be able to justify your reasoning for the shape.

4. Suppose the graph below represents a function f. Draw a graph of f'.

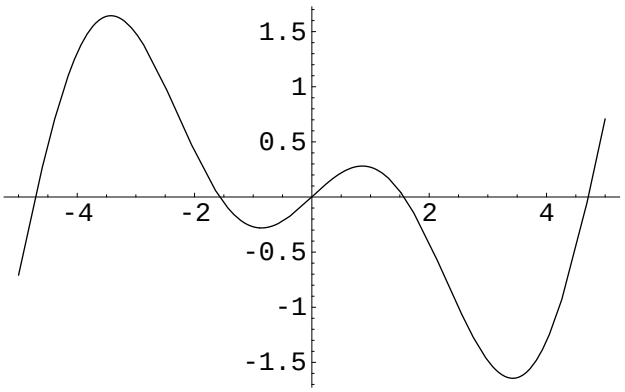

Figure 1: graph of f

5. Suppose that for all x in the domains of f and g, $f(x) = g(x)$. Then is $f'(x) = g'(x)$? Why or why not?

6. Suppose $f(1) = 2$, and $xf(x) + 6 = f(x)^3$. Find $f'(1)$.

7. Take derivatives of the following **with respect to** x:
a) $(x+1)^3$ b) $\sin t$ c) e^{3tx} d)$\cos x \sin x$ e) $\frac{\sin x}{\cos x}$ f) $x \ln x$ d) 5^2

8. Write a paragraph on the most important thing(s) you learned in 3A.

Material from 3B

1. Suppose $g(3) = 2$, and the area underneath the graph of g between the vertical lines $x = 0$ and $x = 3$ is 5. Find an approximation of the area under the graph of g between $x = 0$ and $x = 3.1$.

2. Suppose $g(x) = \frac{1}{x^2}$. Find a function whose derivative is g. How many functions with this property are there? Find a function whose derivative is g and whose graph passes through the point $(1, 2)$.

3. Suppose f is a function representing force applied to an object being pushed up and over a hill, with $f(d)$ being the force applied when the object is d feet from the base of the hill. Draw the hill and draw a graph of f that seems reasonable according to your picture of the hill.
Suppose g is defined by $g(a) = \int_{x=0}^{x=a} f dx$. Draw a graph of g. What does g represent?
Hint: Work is force times the distance over which the force is applied.

4. Draw a graph of an anti-derivative of f in the picture above. Why did I use the word "an"?

5. Suppose that for all x in the domains of f' and g', $f'(x) = g'(x)$. Then is $f(x) = g(x)$? Why or why not?

6. Suppose $3f'(x)f(x)^2 = xf'(x) + f(x)$. Find a number a so that $f(a) = 1$.

7. Take antiderivatives **with respect to x** of everything in problem 7 above.

8. Write a paragraph on the most important thing(s) you learned in 3B.

9. **Compare these problems with the ones from 3A if you get stuck**.

GOOD JOB!!!