Math 118 February 18, 2008 Name:_____

MIDTERM #1

This exam is 4 pages long (counting this one); check that you have all the pages. Show your work. Correct answers with no justification may receive little or no credit. No books or notes are allowed. You may use a calculator, **but none of its calculus functions**. No unnecessary simplification is required. Use the backs of pages if you run out of space, make sure that I can find your answers, and THINK JOYFULLY.

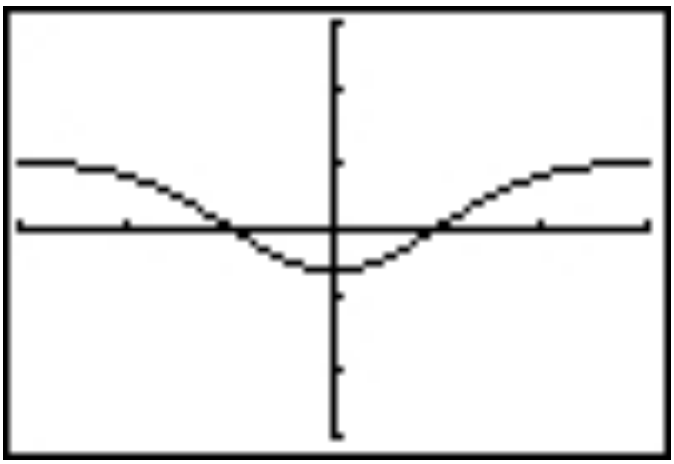
PROBLEM	POINTS	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
EXTRA CREDIT	2	
TOTAL	100	

1. Find the equation of the line tangent to the graph of $f(x) = 4x + \dfrac{1}{x}$ when $x = -1$.

2. You know two things about the function $f(x)$: $f(0) = 0$, and the graph of $f'(x)$ is as shown below. (That's $f'(x)$, **not** $f(x)$!) Sketch the graphs of $f(x)$ and $f''(x)$ on the axes below.

$f(x)$:

$f'(x)$:



$f''(x)$:

3. It's well known that the number of whiskers on a yeti's head is proportional to the cube of the yeti's height. If a 2-meter-tall yeti has 1000 whiskers, how tall is a yeti that has 700 whiskers?

4. Let $f(t)$ be the average height of a t-year-old female in the United States in the years 1999-2002. We have the following data (from the CDC):

t	$f(t)$
11	59.6
12	61.4
13	62.6
14	63.7

(a) Estimate $f'(14)$.

(b) Use your answer to (a) to estimate the average height of a 15-year-old female.

5. Becky's heart rate, H (measured in beats/minute), is a function of the amount of coffee she's drunk, c (measured in liters), so $H = f(c)$.

(a) Explain, in words, the meaning of the following expressions or equations. (Your explanations should be understandable by someone who hasn't taken calculus. Units may be helpful.)

(i) $f(2) = 120$

(ii) $f^{-1}(90)$

(iii) $f'(2) = 30$

(b) Use the information above to estimate her heart rate when she's drunk 1.5 liters of coffee.

EXTRA CREDIT State the limit definition of the derivative $f'(a)$.