Math F200X   Sample Midterm 2   Spring 2010

Name: _____

Id: _____

Rules:

You have 60 minutes to complete the exam.

Partial credit will be awarded, but you must show your work.

No calculators, books, notes, or other aids are permitted.

Turn off anything that might go beep during the exam.

If you need extra space, you can use the back sides of the pages. Please make it obvious when you have done so.

Good luck!

Problem	Possible	Score
1	20	
2	10	
3	20	
4	20	
5	20	
6	10	
6	70	
Total	100	

1. (20 points)

Use the linear approximation to find an approximate value of

$$(9.1)^{3/2}.$$

2. (20 points)

Air is being slowly released from a spherical balloon at a constant but unknown rate of A cm^3/s. At time $t = 0$, the radius of the balloon is observed to be 10 cm and the radius is observed to be decreasing at the rate of $\frac{1}{2}$ cm/s. Determine the amount of time it will take to empty the balloon. (*Hint:* First compute A.)

3. (20 points)

Compute the following derivatives. Do not simplify your answers unless you really want to.

a $\dfrac{d}{dx} \arctan\left(\dfrac{1-x}{1+x}\right)$

b $\dfrac{d}{dt} t^3 e^t \tan(2t)$

c $\dfrac{d}{dx} x^{\sin(x)}$ *Hint:* $a^b = e^{\ln(a^b)}$

d $\dfrac{d^{22}}{dx^{22}} x^{20} + e^{5x+8}$

4. (20 points)

a   Find all values of x such that the tangent line of the graph of the function

$$f(x) = e^{2x}(\sin(2x) - \cos(2x))$$

is horizontal.

b   Find y'' by implicit differentiation if

$$y + e^y = x.$$

5. (10 points)

A cup of coffee is sitting in a room. The temperature of the coffee at time $t = 0$ is 60 degrees Celsius, and the room temperature is 20 degrees Celsius. At time $t = 10$ minutes the coffee has cooled to 55 degrees celsius.

    a   What will the temperature be at time $t = 20$ minutes?

    b   The coffee was originally 90 degrees celsius. How long ago was the coffee placed in the room?

6. (10 points)

Compute the derivative of

$$y = \frac{x\sqrt{x^2 + 1}}{(x + 1)^{3/2}}$$

using logarithmic differentiation.