Math F200X Midterm 3 Fall 2004

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	20	
3	20	
4	20	
5	20	
Total	100	

1. (20 points)

Use the linear approximation to find an approximate value for

$$(9.1)^{\frac{3}{2}}.$$

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)

Sketch the graph of the function $\ln(1+x^2)$. Your sketch must include and label all local minumums, local maximums, points of inflection, and vertical and horizontal asymptotes.

4. (20 points)

Compute the following limits.

a $\lim_{x\to 0} \frac{\ln(1+x)}{x}$

b $\lim_{x\to 0} \frac{1-e^{-x^2}}{\sin^2(x)}$

c $\lim_{x\to\infty} x^{\frac{1}{x}}$

5. (20 points)

Consider the geometric shape of a cylinder of height h and radius r topped with a semispherical cap of radius r. Find all values of r such that the volume of this shape is V and such that the surface area is minimized. Be sure to show that you have found a global minimum. (Recall that the volume of a sphere of radius r is $\frac{4}{3}\pi r^3$ its surface area is $4\pi r^2$).