Math 180 F

THIRD HOUR EXAM

NAME_____

General Notes:

1. Show work.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam.

Friday, Nov. 14, 2008
100 pts

I. Definitions, theorems, and the like

1. (5 pts.) State the Extreme Value Theorem (with preconditions)

2. (5 pts.) State Rolle's Theorem (with preconditions)

3. (5 pts.) State the Mean Value Theorem (with preconditions)

4. (5 pts.) Give a geometric interpretation of the Mean Value Theorem (i.e., talk about what it means in terms of derivatives and tangents and include a brief sketch).

3. (5 pts. each unless otherwise marked.)

a. What is $\tan^{-1}(1)$ (= ArcTan(1)). Give your answer as a number, not a definition.

b. Define sinh(x) (i.e., say what it is in terms of other functions)

c. $\frac{d}{dx}\sinh(x)$

(continued from the preceding page)

d (10 pts.) **Using logarithmic differentiation**, find y' for $y = \dfrac{(2x-1)(3x+2)}{(x-1)}$

e. Find the linear approximation to $f(x) = \sqrt{x}$ at the point (4,2)

f. Using the linear approximation, give an approximate value for $\sqrt{4.01}$

II. Other problems

1. (15 pts.). Suppose that we know that the velocity of a moving object is given by $v(t) = 3t^2 + 4t + 10$ and that $x(0) = 5$. Recalling that $v = \frac{dx}{dt}$, write the equation of motion x(t) for this object.

2. (15 pts.) The point (1, 7) lies on the curve define by $x^2 + y^2 + 4x - 6y = 12$. What is the slope of the line tangent to the curve at the point (1, 7)? The slope of the line perpendicular to the tangent line at that point?

3. (15 pts.) Air is being pumped into a spherical balloon at the rate of 3 cubic inches per minute. How fast is the radius of the balloon changing when the radius is 10 inches? Please recall that the volume of a sphere is given by $V = \frac{2}{3}\pi r^3$.