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. 16, 2007
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. Define cosh(x) (i.e., say what it is in terms of other functions)

b. $\frac{d}{dx}\cosh(x)$

c. $\frac{d}{dx}(3x^4 + x^2 + 1)^{10}$

d. $\frac{d}{dx}e^{\sin(x^2)}$

e. $\frac{d}{dx}e^{\ln(x)}$

(continued from the preceding page)

f Using logarithmic differentiation, find y' for $y = \left(\frac{1}{x-1}\right)\left(\frac{1}{x-2}\right)\left(\frac{1}{x^2+1}\right)$

g. $\frac{d}{dx}\sin^{-1}(x)$ (arcsin)

h. $\cos(\sin^{-1}(x)) = ?$ (please give your answer in terms of **x**)

II. Other problems

1. (10 pts.). Suppose that we know that the derivative of a function f is $f'(x) = 2x$ and that f(0) = 5. Find f(x).

2. (15 pts.) Find the equation of the lines tangent and normal to the curve $\frac{x^2}{9} + \frac{y^2}{4} = 1$ at the point $(\sqrt{3}, 2\sqrt{\frac{2}{3}})$ by first finding the slope at that point $\frac{dy}{dx}$ using implicit differentiation and then using the slope and the point to find the tangent and normal lines at that point.

3. (15 pts.) The lengths of the sides of length x are all increasing at the rate of $\frac{dx}{dt} = 2\frac{in}{\min}$. The volume of the cube is given by $\mathbf{V}(x) = x^3$. How fast is the volume increasing when x = 10 in?