Math 180 C

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. 10, 2006
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.

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

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

b. $\frac{d}{dx}(2x^3 + x^2 + x - 1)^7$

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

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

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

(continued from the preceding page)

f Check your answer to question (e) above (the derivative of the secant function) by writing $\sec(x) = \frac{1}{\cos(x)}$ and using the quotient rule to calculate the derivative, arriving at your answer to question (e) above. Show all parts of your work in the derivation.

g. $\frac{d}{dx}\tan^{-1}(x)$ (arctan)

h. $\sin(\cos^{-1}(x))$

II. Other problems

1. (10 pts.). Suppose that we know that the derivative of a function f is $f'(x) = 3x^2 - 7$ and that f(0) = 10. Find f(x).

2. (15 pts.) Find the equation of the lines tangent and normal to the curve $x^2 + y^2 = 1$ at the point $(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$ 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. (Don't just give the answer - you can check your work by looking at a diagram, but I want to see your calculus and algebra work on this problem).

3. (15 pts.) The radius of a sphere is increasing at the rate of 10 in/sec. How fast is the surface area of the sphere changing when the radius is 100 inches? Please recall that the surface area of a sphere is given by the formula $Area = 4\pi r^2$