Math 170-007
March 16, 2004

Exam 2 Name _____

This test consists of 4 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

1. Find the derivative of each of the following functions. DO NOT SIMPLIFY!!

(6) (a) $f(x) = x^2 + 2x - 5$

(6) (b) $g(x) = \sin(x^2 + 3)$

(6) (c) $y = \tan^{-1}(2x)$

(6) (d) $f(x) = e^{2x} + \ln(x^2 - 1)$

(6) (e) $f(x) = \cos(x)\sin(x)$

(10) 2. Find and simplify the derivative of

$$f(x) = \frac{x}{\sqrt{x^2+2}}$$

(10) 3. Use implicit differentiation to find y' if

$$x^2y + 2y = 4x^2 + 5$$

4. The equation of motion of a particle is given by

$$s = 2t^3 - 15t^2 + 36t + 2 \quad t \geq 0$$

(5) (a) Find the velocity and acceleration of the particle (as a function of t)

(5) (b) Find the acceleration at the instant(s) the velocity is 0.

(10) 5. Use the definitions of the hyperbolic trig functions to prove

$$\tanh(\ln(x)) = \frac{x^2 - 1}{x^2 + 1}$$

(10) 6. Use a linear approximation to $f(x) = \sqrt[3]{x}$ at the point $(8, 2)$ to find an approximate value for $\sqrt[3]{9}$

(10) 7. Find an equation of the tangent to the curve $y = e^x$ that is parallel to the line $x - 4y = 1$

(10) 8. The volume of a cube is increasing at a rate of 10 cc/min. How fast is the surface area increasing when the length of an edge is 30cm?