Math 170-007 **Exam 2** Name ______________________

October 20, 2004

This test consists of 5 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:

(5) (a) $f(x) = x^2 + 7x - 5$

(5) (b) $g(t) = t\sin(t)$

(5) (c) $h(x) = \dfrac{\sec(x) + \tan(x)}{x^2 + 1}$

(5) (d) $f(x) = e^{3x}$

(5) (e) $f(x) = \tan^{-1}(2x)$

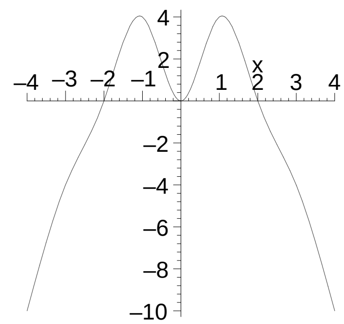
(10) 2. Find and simplify the derivative of

$$f(x) = \frac{x^2 + 2}{\sqrt{x^2 - 5}}$$

(10) 3. If $f(x) = \sec^{-1}(x)$, what is $f'(x)$ and what is the exact value of $f(-2\sqrt{3}/3)$?

(10) 4. The graph of a function f goes through the point $(3, 5)$ and $f'(x) = \sqrt{x^2 + 16}$. Approximate $f(3.01)$ using either differentials or a linear approximation.

5. The following is the graph of the *derivative* of a function f.



(5) (a) At what x values is the second derivative equal to zero?

(5) (b) At what x values does the function have a horizontal tangent?

(5) (c) If $f(-1) = 2$, what is an equation of the line tangent to the graph of f when $x = -1$?

(5) (d) Where is the second derivative of f positive and where is it negative?.

(15) 6. A shape of a cylinder is changing in such a way that the volume is always 256π cubic millimeters. If the height is decreasing at a rate of 1mm/sec, how fast is the radius increasing at the instant the radius is 4mm?

(10) 7. Suppose the following equation implicitly defines y as a function of x. Find an equation of the tangent to the graph of the equation at the point (1,1).

$$\sqrt{x^2+y^2}+2xy=\sqrt{x+y}+x^2y^2+1$$