Math 170-004
November 21, 2003

Exam 3 Name _____

This test consists of **??** 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. Let $f(x) = 2x^3 - 3x^2 - 12x + 3$

(12) (a) What are the critical values for f?

(13) (b) What are the absolute maximum and minimum values of f on the interval $[-2, 1]$?

(10) 2. If $f'(x) < 4$ on the interval $[1, 3]$ and $f(1) = -2$, show that $f(3) < 6$

3. Let $f(x) = \dfrac{x^2}{x^2 - 1}$

(5) (a) Find and simplify $f'(x)$.

(5) (b) On what intervals is the graph of f increasing?

(5) (c) On what intervals is the graph of f decreasing?

(4) (d) What are the local extrema of f?

Question ?? continued: $f(x) = \dfrac{x^2}{x^2 - 1}$

(5) (e) Find and simplify $f''(x)$

(5) (f) On what intervals is the graph of f concave up?

(5) (g) On what intervals is the graph of f concave down?

(4) (h) What are the inflection points of f

Question ?? continued $f(x) = \dfrac{x^2}{x^2 - 1}$

(5) (i) Sketch the graph of f.

(12) 4. Evaluate the following limits

$$\lim_{x \to 0} \frac{e^{3x} - 1}{x}$$

(10) 5. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$