Math 170-006
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 $f(x) = 2x^3 + 3x^2 - 12x - 3$.

(8) (a) What are the critical values of $f$?

(7) (b) What is the absolute maximum and absolute minimum of $f$ on the interval $[-3, 0]$

(10) 2. Suppose $f'(x) > -2$ for all $x \in [3, 5]$ and $f(2) = 1$. Show $f(5) > -3$.

(10) 3. Find and identify the local extrema for $f(x) = (x^2 - 1)^3$

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

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

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

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

(12) 5. Evaluate the following limit

$$\lim_{x \to \infty} x \tan(1/x)$$

(10) 6. Find the dimensions of the rectangle of largest area that can be inscribed in an equilateral triangle of side 10 if one side of the rectangle lies on the base of the triangle.