NAME ______________________________ Rec. Instr., Time __________________

CALCULUS I - EXAM II

October 26, 2004

Show all work for full credit. You may not use a calculator, nor any books or notes. The point value of each problem is given in the left-hand margin.

(12) 1. Calculate the limits

a) $\displaystyle\lim_{x\to+\infty} \frac{3x}{\sqrt{x^2+2}} =$

b) $\displaystyle\lim_{x\to-\infty} \frac{3x}{\sqrt{x^2+2}} =$

c) Write the equations of the horizontal asymptotes to the graph of $f(x) = \dfrac{3x}{\sqrt{x^2+2}}$.

(12) 2. Let $f(x) = \dfrac{3x^2+x+1}{x^2-1}$. In a) and b) below be sure to **show all your work!**

a) Evaluate $\displaystyle\lim_{x\to+\infty} f(x) =$

b) Evaluate $\displaystyle\lim_{x\to-\infty} f(x) =$

c) Give the equation of the horizontal asymptote for the graph of $f(x)$.

d) Give the equations of all vertical asymptotes for the graph of $f(x)$.

(6) 3. Calculate

$$\lim_{x\to\infty} \frac{5\cos x}{x} =$$

(10) 4. Locate the absolute extrema of the function $g(t) = \dfrac{t}{t-2}$ on the closed interval $[3, 5]$.

(10) 5. a) State the mean value theorem: If $f(x)$ is continuous on $[a, b]$ and .... on (a, b), then there exists a point c in (a, b) such that ....

b) Show that the function $f(x) = \sqrt{2-x}$ satisfies the hypothesis of the mean value theorem on the interval $[-7, 2]$, and find all numbers c that satisfy the conclusion of that theorem.

(14) 6. Let $f(x) = (1-x)(\sqrt[3]{x})$.

a) Calculate $f'(x)$ and simplify your answer (in factored form).

b) List the critical numbers of $f(x)$:

c) Draw a number line to indicate the open intervals where $f(x)$ is increasing and decreasing.

d) Classify each of the critical numbers of $f(x)$ as either a local minimum, local maximum or neither.

(8) 7. Determine the points of inflection of the function $h(s) = s + \cos s$ that lie in the interval $[0, 2\pi]$.

(14) 8. Sketch the graph of the function $g(x) = x^3 - 3x^2 + 3$ as follows:

a) Give the exact values of all critical points and draw a number line showing where $g(x)$ is increasing and decreasing.

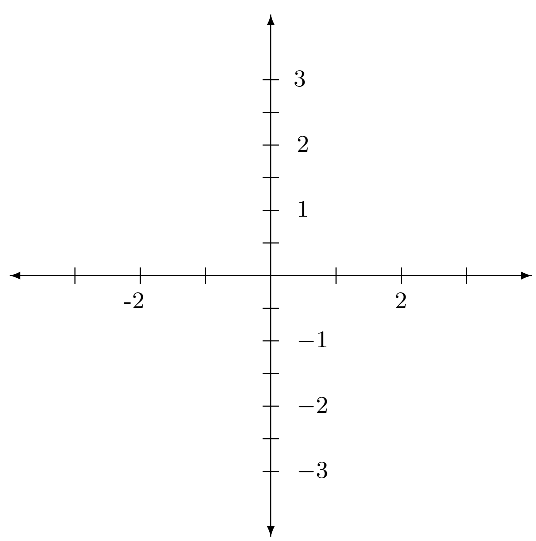
b) Evaluate: $\lim_{x \to +\infty} g(x) =$ ...., $\lim_{x \to -\infty} g(x) =$ ....

c) Give the exact x-coordinates of all inflection points of $g(x)$. Draw a number line indicating where the graph of $g(x)$ is concave up and concave down.

d) In the table below, give both coordinates of all local minima and maxima.

e) Sketch the graph of $g(x)$.

x	$y = g(x)$



(14) 9. Determine the dimensions of a rectangular solid (with a square base) of maximum volume if its surface area is 150 square inches.