

Math 170-003
April 15, 2005

Exam Name _____

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.

- (10) 1. Find the absolute maximum and minimum values of the function $f(x) = 4x^3 + 15x^2 - 72x$ on the interval $[-1, 2]$.

- (10) 2. Find the critical values for $f(x) = x^{2/3}(x - 2)$

(10) 3. Find the inflection points of the function $f(x) = x^4 - 6x^2$

(10) 4. Suppose that f is continuous on $[2, 5]$, $f(2) = 0$ and that $-1 \leq f'(x) \leq 1$ for all x in $(2, 5)$. Show that $-3 \leq f(5) \leq 3$.

- (10) 5. Find the local extrema for

$$f(x) = 2 - 2x - x^3$$

- (10) 6. Sketch the graph of a function that satisfies:

$$\begin{array}{ll} f \text{ is odd} & f'(x) < 0 \text{ for } 0 < x < 2 \\ f'(x) > 0 \text{ for } x > 2, & f''(x) > 0 \text{ for } 0 < x < 3 \\ f''(x) < 0 \text{ for } x > 3, & \lim_{x \rightarrow \infty} f(x) = -2 \end{array}$$

7. Evaluate the following limits:

(7) (a) $\lim_{x \rightarrow 0^+} x \ln(x)$

(8) (b) $\lim_{x \rightarrow 0} \frac{1 - \cos(x)}{x^2 + x}$

(5) 8. Use two iterations Newton's method, starting with $x_1 = 2$, to approximate $\sqrt[3]{7}$

- (10) 9. Find two positive integers such that the sum of the first number and four times the second is 1000 and the product of the numbers is as large as possible.

- (10) 10. If $f''(x) = 2x^3 + 3x^2 - 4x + 5$ and $f(0) = 2$ and $f(1) = 0$, find $f(x)$.