

# Exam 1

Math 220 Sections 01xx

February 26, 2007

**Instructions:** Put one problem on each answer sheet (use the back if necessary), and put your name, your TA's name, your section number, and the problem number on each page. Only sign the honor pledge on the first sheet. Show all of your work, and justify your answers. Scientific, but **not** graphing calculators are allowed. Unless the problem explicitly requests simplification, no simplification is necessary.

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1. (a) (10 points) Let  $y = 3x^{1.7} - \frac{1}{\sqrt{x}}$ . Compute  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$ .
- (b) (10 points) Let  $f(x) = x^5 - x^4$ . Compute the average rate of change of  $f(x)$  on the interval  $[-1, 1]$ , and the instantaneous rate of change of  $f(x)$  at  $x = 0$ .
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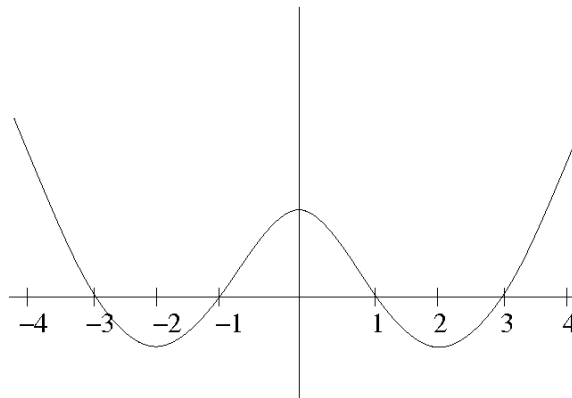
2. (20 points) Eric's company sells 10,000 bottles of hot sauce each year. The cost for a shipment from the hot sauce company is \$100 per order. It costs Eric's company \$50 to hold one bottle of hot sauce over one year. If Eric makes  $r$  orders from the company each year, each consisting of  $x$  bottles of hot sauce, what values of  $r$  and  $x$  should Eric use to minimize the cost to his company?
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3. The graph of the derivative  $f'(x)$  on the interval  $-4 \leq x \leq 4$  is shown to the right.

(a) (10 points) Give intervals where  $f(x)$  is increasing and decreasing.

(b) (10 points) Give intervals where  $f(x)$  is concave down and concave up.

**REMEMBER:** this is the graph of  $f'(x)$ , not  $f(x)$ !



4. Let  $f(x) = x^3 - 3x^2$
- (a) (5 points) Find all intercepts of  $f(x)$ .
- (b) (5 points) Find any critical points of  $f(x)$ .
- (c) (5 points) Find any inflection points of  $f(x)$ .
- (d) (5 points) Sketch the graph of  $f(x)$ , labeling all critical points, intercepts, and inflection points.
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5. (20 points) Susan has 300 feet of fencing to enclose a large rectangular garden. In addition to the fence enclosing the garden, Susan also wants fencing running down the middle of the large garden to divide it into two smaller gardens (see picture). Find the maximum area of Susan's large rectangular garden.

