

MATH 112  
Exam II  
February 23, 2006

Name \_\_\_\_\_

Student ID # \_\_\_\_\_

Section \_\_\_\_\_

HONOR STATEMENT

“I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.”

SIGNATURE: \_\_\_\_\_

1	15	
2	12	
3	13	
4	10	
Total	50	

- Check that your exam contains four problems.
- Turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- If you use a guess-and-check method or read a value from a graph on your calculator when an algebraic method is available, you will not receive full credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (15 points) Compute the derivative. Do not simplify.

(a)  $y = x^3(4x + 9)^{12}$

(b)  $f(z) = [\ln(7e^z + z^2)]^6$

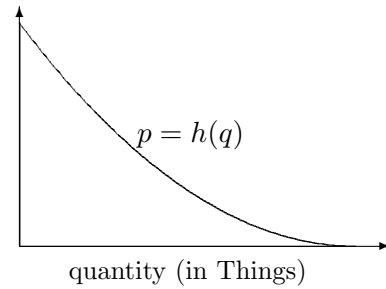
(c)  $y = \frac{e^{3x}(x^4 + 5)}{\sqrt{6x + 1}}$

2. (12 points)

Suppose that in order to achieve monthly sales of  $q$  Things, you have to sell them at a price of

$$p = h(q) = q^2 - 120q + 3600 \text{ dollars each.} \quad \begin{array}{l} \text{dollars} \\ \text{per Thing} \end{array}$$

The graph of this demand function is given at right.



(a) Find the longest interval on which the demand function  $h(q)$  is positive and decreasing.

ANSWER: from  $q =$  \_\_\_\_\_ to  $q =$  \_\_\_\_\_ Things

(b) Give the formula for total revenue.

ANSWER:  $TR(q) =$  \_\_\_\_\_

(c) Find the quantity in the interval from part (a) that will maximize your total revenue. (You must use calculus and show all your work.)

ANSWER:  $q =$  \_\_\_\_\_ Things

(d) What is the price per Thing that you must charge in order to maximize your total revenue?

ANSWER: \_\_\_\_\_ dollars per Thing

3. (13 points) Let  $f(x, y) = 5x^2 - 39.8x + 6y^2 - 73y + xy + 4$ .

(a) Compute the partial derivatives  $f_x(x, y)$  and  $f_y(x, y)$ .

ANSWERS:

$$f_x(x, y) =$$

$$f_y(x, y) =$$

(b) Find all points  $(x, y)$  that are candidates for a local maximum or local minimum of  $f(x, y)$ .

ANSWER:  $(x, y) =$  \_\_\_\_\_

(c) Let  $g(t) = f(t, 15)$  and  $h(t) = f(10, t)$ . Which is steeper, A or B?

A. the graph of  $g(t)$  at  $t = 10$

B. the graph of  $h(t)$  at  $t = 15$

(You must show some work to justify your answer.)

ANSWER: (circle one)      A      B

4. (10 points) You run a small business selling cat treats in two flavors: Tuna and Liver. Each day, you can produce as many as 200 bags of the Tuna and 150 bags of the Liver. But, due to the size of your delivery vehicle, you can only transport a total of 280 bags of treats. You earn \$1.25 in profit for each bag of the Tuna and \$1.40 in profit for each bag of the Liver.

Let  $x$  be the number of bags of Tuna and  $y$  be the number of bags of Liver that you will produce. Use the method of linear programming to find the amounts of each flavor that will maximize your profit.

ANSWER:  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_ bags