

MATH 112
Exam II - Version 1
May 20, 2004

Name _____

Student ID # _____

Section _____

1	16	
2	16	
3	18	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains three problems on three pages.
- Please 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.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (16 points) Let $f(x) = 4x^3 - 33x^2 + 30x + 200$. (As always, you must show all your work. Reading values off a graph from your calculator will not earn you full credit.)

(a) Find all values of x at which $f(x)$ has a horizontal tangent.

ANSWER: $x =$ _____

- (b) Use the Second Derivative Test to determine whether the smallest x -value you found in part (a) gives a local maximum or a local minimum value of $f(x)$.

ANSWER: circle one: global max global min

- (c) Find the global maximum value of $f(x)$ on the interval from $x = 0$ to $x = 10$.

ANSWER: _____

- (d) Find the global maximum value of $f''(x)$ on the interval from $x = 3$ to $x = 6$.

ANSWER: _____

2. (16 points) You sell scarves and mittens. Each scarf costs you \$12 to produce and each pair of mittens costs you \$20 to produce.

- (a) Give a formula for $C(s, m)$, the total cost (in hundreds of dollars) to produce s hundred scarves and m hundred pairs of mittens. (Assume you have no fixed costs.)

ANSWER: $C(s, m) =$ _____

- (b) Your total revenue (in hundreds of dollars) is given by the function

$$R(s, m) = 2s^2 + 3m^2 - sm.$$

Give a formula for $P(s, m)$, the profit you earn (in hundreds of dollars) by selling s hundred scarves and m hundred pairs of mittens.

ANSWER: $P(s, m) =$ _____

- (c) Compute the two partial derivatives of Profit.

ANSWER: $\frac{\partial P}{\partial s} =$ _____
 $\frac{\partial P}{\partial m} =$ _____

- (d) Find all candidates for local minima and local maxima of $P(s, m)$.

ANSWER: _____

- (e) Suppose you've sold 5 hundred scarves and 7 hundred pairs of mittens. Use a partial derivative to estimate the increase in your profit if you sell one more pair of mittens.

ANSWER: \$ _____

3. (18 points) Bilpo sells two different specialty dogfood formulas. Each bag of Active Dog Formula contains 4 pounds of lamb. (The rest is rice and “fillers.”) The Senior Dog Formula contains 2 pounds of lamb in each bag.

In one week, Bilpo is supplied with 4000 pounds of lamb and enough packaging for up to 800 bags of Active Dog and 1500 bags of Senior Dog. They make \$5.50 profit from each bag of Active Dog and \$7.50 profit from each bag of Senior Dog.

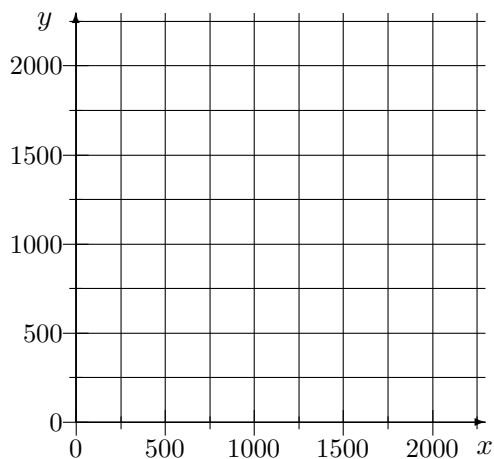
Let x be the number of bags of Active Dog and y be the number of bags of Senior Dog produced in one week. You will be asked to find the values of x and y that yield the maximum profit.

- (a) This is a linear programming problem with three constraints. Give the constraints and the objective function.

CONSTRAINTS: _____

OBJECTIVE FUNCTION: _____

- (b) Sketch the feasible region and clearly label all its vertices.



- (c) How much of each type of food must Bilpo sell in order to maximize profit? (As always, show all work needed to justify your answer.)

ANSWER: _____ bags of Active Dog

_____ bags of Senior Dog