

Math 120 B and C - Winter 2006

Exam 1

January 26, 2006

Name: _____

Section: _____

Student ID Number: _____

TA's Name: _____

| | | |
|-------|----|--|
| 1 | 8 | |
| 2 | 15 | |
| 3 | 15 | |
| 4 | 12 | |
| Total | 50 | |

- You are allowed to use a calculator and one **hand-written** 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- Check that your exam contains all the problems listed above.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit. Unless otherwise indicated, your **final answer** must be correct to two digits after the decimal.
- If you need more room, use the backs of the pages and indicate to the grader that you have done so.
- Raise your hand if you have a question.
- There are multiple versions of the exam. Any student found engaging in academic misconduct will receive a score of 0 on this exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (8 points) Let $f(x) = 1 + 2x - 3x^2$.

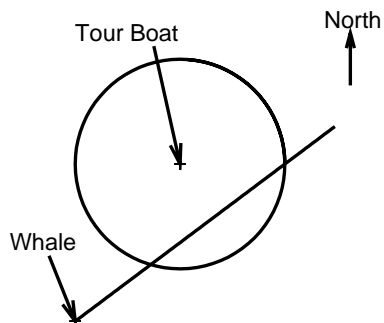
(a) Simplify the following expression far enough so that plugging in $h = 0$ would be allowed.

$$\frac{f(x+h) - f(x)}{h}$$

(b) Simplify the following expression far enough so that plugging in $a = 0$ would be allowed.

$$\frac{f(2a) - f(a)}{a}$$

2. (15 points) A tour boat for whale watchers is sitting in one spot out on the ocean. The boat has a radar that will detect any whale within a radius of 4 miles. A whale is currently located 4 miles west and 6 miles south of the boat. The whale travels directly toward the easternmost edge of the radar zone at 10 mph. How long (in hours) will the whale be in the radar zone?



3. (15 points) Kramer has an apple orchard. One season, his 200 trees yielded 100 apples per tree, which gives a production of 20,000 apples. Kramer has a limited amount of space and if he adds more trees to his orchard it will decrease his yield per tree. For every 10 additional trees that Kramer adds to his orchard, he will lose 6 apples per tree.

(a) Find a linear model which gives the number of apples per tree, y , in terms of the number of trees, x .

(b) Write a formula for the total production of apples, $P(x)$, in terms of trees, x , and use this formula to determine how many trees Kramer should have in the orchard to maximize his production of apples. (Round your final answer to the nearest tree.)

4. (12 points) Let $g(x) = x + 7$, $h(x) = x^2 + 1$, and $f(x) = \begin{cases} x^2 + 2 & , \text{ if } x \geq 2 \\ 2x - 1 & , \text{ if } x < 2 \end{cases}$.

(a) The function $h(g(x))$ is quadratic.

Give the formula for $h(g(x))$ and find the x and y coordinates of the vertex.

(b) Find all solutions for x in the following equation:

$$f(x) = 11$$

(c) Write the multipart rule for $f(g(x))$.