

MATH 112 C  
Exam I - Version 1  
January 29, 2004

Name \_\_\_\_\_

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

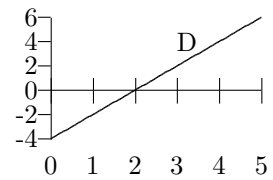
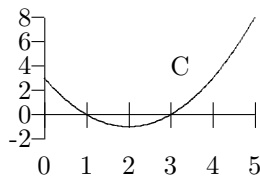
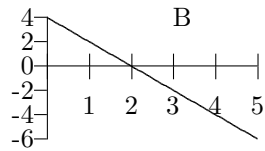
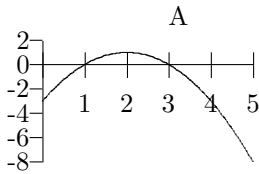
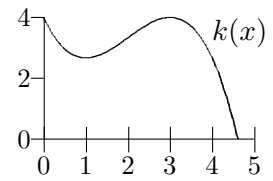
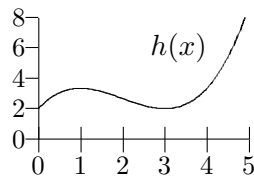
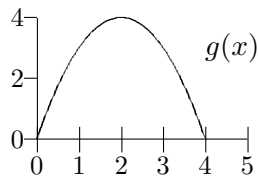
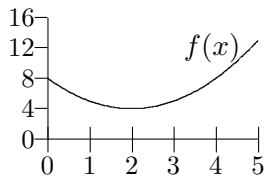
Section \_\_\_\_\_

1	8	
2	8	
3	17	
4	17	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains four problems on four 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. (8 points) Match each graph in the top row with its derived graph in the bottom row. You need not show any work.



ANSWERS: Fill in each blank with one of the letters A, B, C, or D.

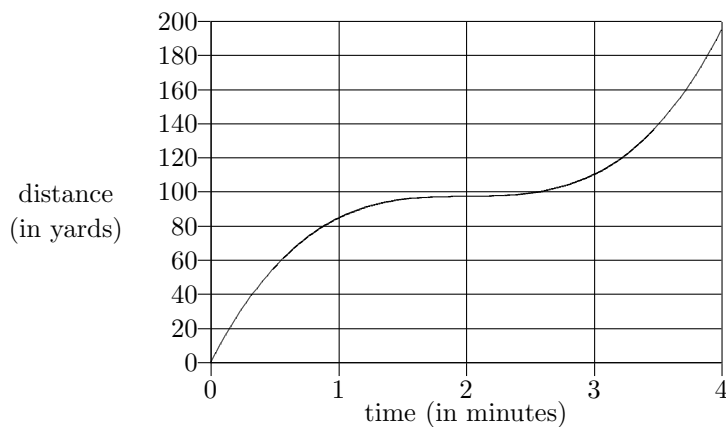
The derived graph of  $f(x)$  is graph \_\_\_\_\_.

The derived graph of  $g(x)$  is graph \_\_\_\_\_.

The derived graph of  $h(x)$  is graph \_\_\_\_\_.

The derived graph of  $k(x)$  is graph \_\_\_\_\_.

2. (8 points) An object moves in a straight line so that its distance at time  $t$  is given by the following graph.



You need not show any work to answer the following questions.

- (a) Which of the following best describes the object's instantaneous speed from  $t = 0$  to  $t = 4$ ?
- It increases and then decreases.
  - It decreases and then increases.
  - It always increases.
  - It always decreases.

ANSWER: \_\_\_\_\_

- (b) Which is larger:

- (A)  $D'(1)$  or (B)  $D'(2)$ ?

ANSWER: \_\_\_\_\_

- (A) the object's instantaneous speed at  $t = 1$  or (B) the object's average speed from  $t = 1$  to  $t = 1.5$ ?

ANSWER: \_\_\_\_\_

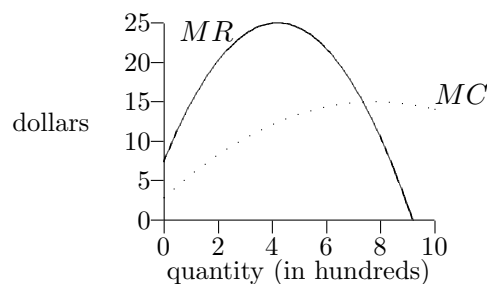
- (c) Which of the following is closest to the value of  $D'(3)$ ?

- 0 yards per minute
- 35 yards per minute
- 50 yards per minute
- 80 yards per minute

ANSWER: \_\_\_\_\_

3. (17 points)

The graphs to the right are of marginal revenue ( $MR$ ) and marginal cost ( $MC$ ) for selling Items. Note that quantity is measured in *hundreds of Items*, while  $MR$  and  $MC$  are in *dollars*.



(a) (3 points) The formula for total cost ( $TC$ ), in *hundreds of dollars*, is

$$TC(q) = -0.07q^3 + 1.56q^2 + 2.83q + 40.$$

Use the derivative rules to find the formula for  $MC(q)$ .

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

(b) (2 points) Compute the cost of the 401<sup>st</sup> item.

ANSWER: \_\_\_\_\_ dollars

(c) The formula for marginal revenue, in dollars, is  $MR(q) = -q^2 + 8.4q + 6.38$ .

i. (4 points) Determine the quantity  $q$  at which the profit for manufacturing Items is the greatest. (Compute your answer using the formulas. Do not just estimate from the graph.)

ANSWER:  $q =$  \_\_\_\_\_ hundred Items

ii. (4 points) Choose the quantity  $q$  between 2 and 5 hundred Items that gives the greatest profit. Explain your answer.

ANSWER:  $q =$  \_\_\_\_\_ hundred Items

EXPLANATION:

iii. (4 points) Determine the value of  $q$  at which the tangent line to the graph of marginal revenue has slope 7.

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

4. (17 points) Consider two functions  $f(x)$  and  $g(x)$ . The formula for  $f(x)$  is:

$$f(x) = -2x^2 + 18x + 9.$$

You do not know the formula for  $g(x)$ , but you do know that the slope of a secant line through  $g(x)$  at  $x = m$  and  $x = m + h$  is given by:

$$\frac{g(m+h) - g(m)}{h} = 6m + 3h - 4.$$

- (a) (4 points) Compute and simplify  $\frac{f(4+h) - f(4)}{h}$ .

ANSWER:  $\frac{f(4+h) - f(4)}{h} =$  \_\_\_\_\_

- (b) (3 points) Use the derivative rules to find  $f'(x)$ .

ANSWER:  $f'(x) =$  \_\_\_\_\_

- (c) (3 points) Compute the value of  $\frac{g(2.003) - g(2)}{0.003}$ .

ANSWER:  $\frac{g(2.003) - g(2)}{0.003} =$  \_\_\_\_\_

- (d) (3 points) Write out a formula in terms of  $k$  for  $g(4+k) - g(4)$ .

ANSWER:  $g(4+k) - g(4) =$  \_\_\_\_\_

- (e) (4 points) Let  $a$  be the number with the property that  $f'(a) = 6$ . Compute the slope of the tangent line to  $g(x)$  at  $x = a$ .

ANSWER: \_\_\_\_\_