

Math 112 - Spring 2007
Exam 1
April 24, 2007

Name: _____

Section: _____

Student ID Number: _____

1	12	
2	13	
3	13	
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 use a guess-and-check, or calculator, method when an algebraic method is available, you may not receive full credit.
- 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. In addition, students found engaging in academic misconduct are typically put on academic probation. So DONT CHEAT! It could serious hurt your career.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (12 points) Compute the derivatives. The correct answer with no supporting work receives *no points*. You do not have to simplify your final answer. Put a box around your final answer.

(a) (4 points) Find y' , if $y = \frac{3}{x^2} + \frac{\sqrt{x}}{5} + (3x^4)^2 + 4x^2x^4$.

(b) (4 points) Find $g'(x)$, if $g(x) = \frac{x^2 - 5x + 7}{2x^2}$.

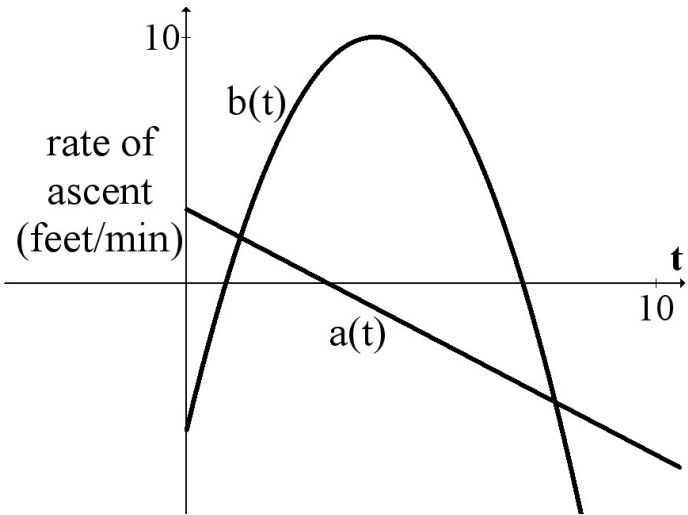
(c) (4 points) Find $\frac{dw}{dt}$, if $w = (t + 2t^{-1/2} + \frac{3}{t^{3/2}})\sqrt{t}$.

2. (13 points)

Two balloons, A and B , are moving vertically straight up and down. At time $t = 0$, the balloons are both at a height of 100 feet. The formulas for the rate of ascent are given by:

$$a(t) = -t + 3 \quad \text{and} \quad b(t) = -t^2 + 8t - 6,$$

where t is in minutes and the rate of ascent is in feet/minute. The rate of ascent graphs are given at right.



(a) (3 points) Give the **rate of ascent** of balloon B at $t = 6$ minutes and determine if balloon B is rising or falling in **altitude** at this time.

ANSWER: rate of ascent = _____ feet/minute
(clearly circle one) RISING or FALLING

(b) (3 points) Find the time, between $t = 0$ and $t = 10$, when the **altitude** of balloon A is highest.

ANSWER: $t =$ _____ minutes

(c) (3 points) Which of the following best describes the motion of balloon B from $t = 0$ to $t = 10$? (clearly circle one and write your answer in the space provided.)

- i. the altitude increases and then decreases
- ii. the altitude decreases and then increases
- iii. the altitude increases, then decreases, and then increases again
- iv. the altitude decreases, then increases, and then decreases again

ANSWER: _____

(d) (4 points) Find the time, in the first 2 minutes, when the distance between the balloons is largest.

ANSWER: $t =$ _____ minutes

3. (13 points) Consider the function $H(x)$. You do not know the formula for $H(x)$, but you do know that the formula for the change in height of $H(x)$ from $x = p$ to $x = p + r$ is given by

$$H(p + r) - H(p) = 6r^2 - 7pr + 2r.$$

(a) (3 points) Find a formula involving k for $H(6 + k) - H(6)$.

ANSWER: $H(6 + k) - H(6) =$ _____

(b) (3 points) If $H(6) = 70$, find the value of $H(8)$.

ANSWER: $H(8) =$ _____

(c) (3 points) Find the slope of the secant line to $H(x)$ from $x = 4$ to $x = 6$.

ANSWER: slope = _____

(d) (4 points) Find a formula for $\frac{H(x+h) - H(x)}{h}$ and use it to find a formula for $H'(x)$.

ANSWER: $\frac{H(x+h) - H(x)}{h} =$ _____ $H'(x) =$ _____

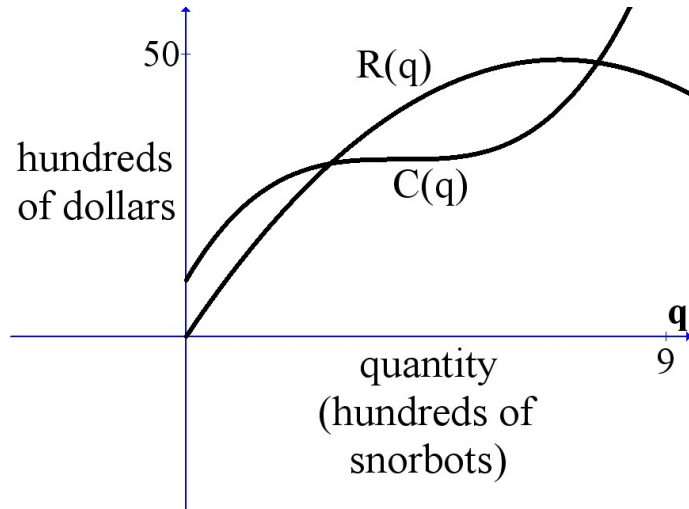
4. (12 points)

You own a business that sells Snorbots. The functions for total revenue (TR) and total cost (TC) are given by

$$TR: R(q) = -q^2 + 14q$$

$$TC: C(q) = \frac{q^3}{3} - 4q^2 + 16q + 10$$

where $R(q)$ and $C(q)$ are in **hundreds** of dollars and q is in **hundreds** of Snorbots. The graphs of these functions are shown at right.



(a) (2 points) Use the derivative rules to find formulas for MR and MC .

ANSWER: $MR =$ _____ and $MC =$ _____

(b) (3 points) Find all quantities at which the slope of the tangent line to the total revenue graph is equal to 4.

ANSWER: $q =$ _____ **hundred Snorbots**

(c) (3 points) Between $q = 0$ and $q = 10$, find the largest interval when $R'(q)$ is positive.

ANSWER: from $q =$ _____ to $q =$ _____ **hundred Snorbots**

(d) (4 points) Find the quantity where profit is maximum.
(Round the quantity to the nearest Snorbot.)

Quantity: _____ **Snorbots**