

Math 112 - Spring 2010

Exam 1

April 27, 2010

Name: _____

Section: _____

Student ID Number: _____

1	12	
2	6	
3	6	
4	14	
5	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. Your TA can only clarify the wording of a question, he/she can in no way comment on your work. So don't raise your hand fishing for answers.
- There are multiple versions of the exam so if you copy off a neighbor and put down the answers from another version we will know you cheated. Any student found engaging in academic misconduct will receive a score of 0 on this exam. All suspicious behavior will be reported to the student misconduct board. In such an instance, you will be forced to meet in front of a board of professors to explain your actions.
DO NOT CHEAT OR DO ANYTHING THAT LOOKS SUSPICIOUS!
WE WILL REPORT YOU AND YOU MAY BE EXPELLED!
Keep your eyes down and on your paper. If your TA sees your eyes wandering they will warn you only once before taking your exam from you.
- You have 50 minutes to complete the exam. Use your time wisely: Spend no more than 10 minutes on each page before moving on to the next page (which gives you an extra 10 minutes at the end to check your work).

GOOD LUCK!

1. (12 points) The correct answer with no supporting work receives ***NO POINTS***. Don't do the work in your head, do it on the page. You do not have to simplify your final answer. Put a box around your final answer.

(a) (4 points) Find $\frac{dy}{dx}$, if $y = (4x^2 + 1)(5 - x^3) + 2x$.

(b) (4 points) Find $f'(t)$, if $f(t) = \frac{3t^5 + 4 - \sqrt{t}}{2t^3}$.

(c) (4 points) Find the slope of the tangent line to $g(x) = \frac{x^3}{3} + \frac{5}{x^2} + 6\sqrt[3]{x^2}$ at $x = 1$.

2. (6 points) Let $f(x) = 5x - 3x^2 + 1$.

(a) (4 pts) Write out and *completely simplify* the formula, in terms of h , for

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

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

(b) (2 pts) Find the formula for the derivative $f'(x)$.

ANSWER: $f'(x) =$ _____

3. (6 points) Consider the function $g(x)$. You do not know the formula for $g(x)$, but you do know that the formula for the slope of the secant line to $g(x)$ from $x = m$ to $x = m + h$ is given by

$$\frac{g(m+h) - g(m)}{h} = \frac{3}{(m+1)(m+h+1)}.$$

(a) (3 pts) Find a formula involving k for $g(2+k) - g(2)$.

ANSWER: $g(2+k) - g(2) =$ _____

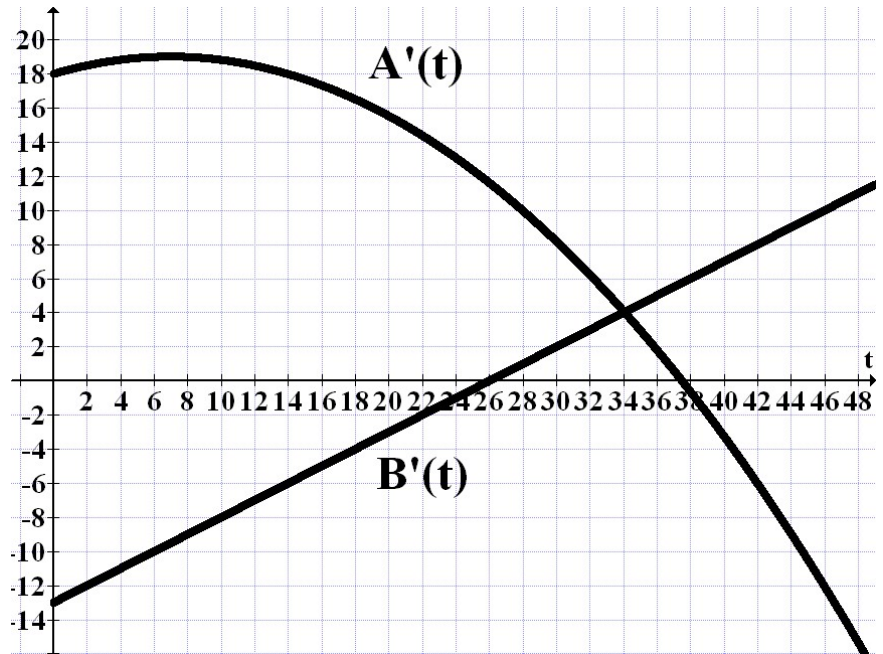
(b) (3 pts) Find the slope of the tangent line to $g(x)$ at $x = 5$.

ANSWER: slope = _____

4. (14 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 200 feet. The graphs of the ***RATE OF ASCENT*** (i.e. speed) are given, where t is in minutes and the rate of ascent is in feet/minute.



Use the graphs to estimate the answers to the following questions. Be as accurate as possible and briefly explain your work (a sentence or short phrase is sufficient).

(a) (3 pts) Find the time when Balloon A is at its highest altitude.

ANSWER: $t =$ _____ min

(b) (3 pts) Give the approximate value of $\frac{B(10.0001) - B(10)}{0.0001}$.

ANSWER: $\frac{B(10.0001) - B(10)}{0.0001} \approx$ _____ ft/min

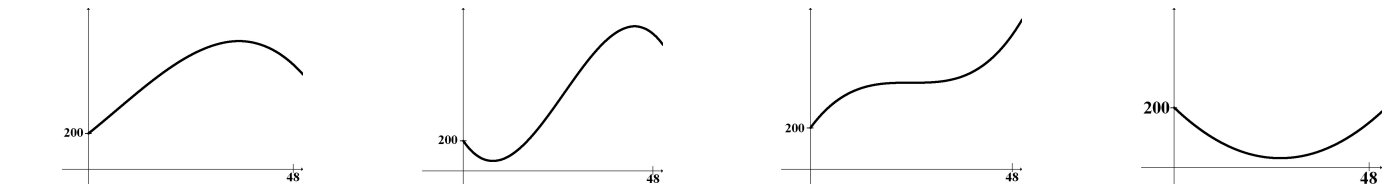
(c) (3 pts) Find the time when Balloon A is above Balloon B by the greatest distance.

ANSWER: $t =$ _____ min

(d) (3 pts) Give the largest interval when Balloon B is rising (increasing altitude) and the vertical distance between the balloons is getting larger.

ANSWER: $t =$ _____ to $t =$ _____

(e) (2 pts) Of the four graphs below, in the blanks provided label the altitude (i.e. distance) graph of Balloon A and the altitude graph of Balloon B . (Two will be left blank).



5. (12 points) You own a business that sells Toy Dinosaurs. The functions for total revenue (TR) and total cost (TC) are given by

$$TR: R(q) = 110q - 3q^2$$
$$TC: C(q) = \frac{q^3}{30} - \frac{3q^2}{2} + 40q + 10$$

where $R(q)$ and $C(q)$ are in **hundreds** of dollars and q is in **hundreds** of toy dinosaurs. Keep all answer accurate to the nearest Toy Dinosaur or the nearest cent.

- (a) (2 pts) Give the formulas for $MR(q) = R'(q)$ and $MC(q) = C'(q)$.

ANSWER: $MR(q) =$ _____

$MC(q) =$ _____

- (b) (3 pts) Find the slope of variable cost $VC(q)$ at $q = 4$ hundred Toy Dinosaurs.

ANSWER: _____ dollars per Toy Dinosaur

- (c) (3 pts) Find an interval of length 3 hundred Toy Dinosaurs over which MR changes from positive to zero to negative.

ANSWER: $q =$ _____ to $q =$ _____ hundred Toy Dinosaur

- (d) (4 pts) Find the quantity where profit is maximum.
(Give your answer to the **nearest Toy Dinosaur**.)

Quantity: _____ **Toy Dinosaurs**