

MATH 112
Final Exam
June 7, 2008

Name _____

Student ID # _____

Section _____

HONOR STATEMENT

“I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam.”

SIGNATURE: _____

1	19	
2	18	
3	15	
4	18	
5	18	
6	12	
Total	100	

- Check that your exam contains 6 problems.
- 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.
- If you use a guess-and-check method or read a value from a graph on your calculator when an algebraic method is available, you may not receive full credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!!

1. (19 points) The rate of ascent in feet per hour of a balloon is given by the function

$$R(t) = 0.48t^2 - 7.2t + 20.25.$$

- (a) Write out all candidates (to within an undetermined constant) for $A(t)$, the balloon's altitude at time t .

ANSWER: $A(t) =$ _____

- (b) The balloon's altitude at $t = 10$ seconds is 400 feet. Compute the balloon's altitude at $t = 0$.

ANSWER: $A(0) =$ _____

- (c) Give all times at which the altitude of the balloon reaches a local maximum or a local minimum. Tell which is which.

ANSWER: $t =$ _____ gives a local _____ (max or min)

$t =$ _____ gives a local _____ (max or min)

- (d) Find the time at which the balloon is falling most rapidly.

ANSWER: $t =$ _____ hours

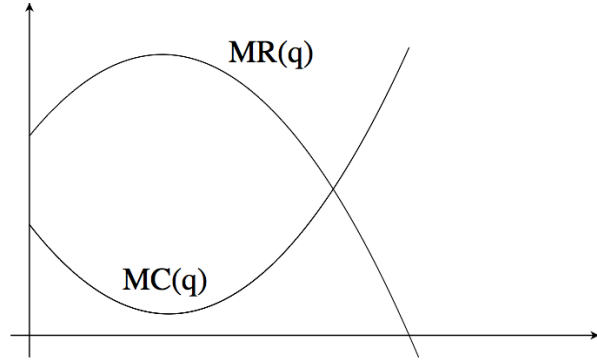
- (e) Fill in the blanks: The balloon _____ (rises or falls?) _____ (how many?) feet in the time period from $t = 4$ to $t = 6$. Justify your answer.

2. (18 points)

You sell **Things**. Your marginal revenue and marginal cost (both in dollars per Thing) for selling q Hundred Things are given by the formulas:

$$MR(q) = -3q^2 + 21q + 90$$

$$MC(q) = 3q^2 - 22q + 50.$$



(a) How much does the value of variable cost increase if q increases from 2 Hundred to 4 Hundred Things?

ANSWER: _____ Hundred Dollars

(b) If you produce 550 Things, your total costs are \$15,862.50. That is, $TC(5.5) = 158.625$ Hundred Dollars. What is the value of your fixed cost?

ANSWER: $FC =$ _____ Hundred Dollars

(c) What quantity maximizes total revenue?

ANSWER: $q =$ _____ Hundred Things

(d) What is the largest value of profit?

ANSWER: _____ Hundred Dollars

3. (15 points) You manage an ice cream factory that makes two flavors: Vanilla Bean and Double Chocolate. Each gallon of Vanilla Bean requires 10 eggs and 12 cups of cream, which each gallon of Double Chocolate requires 8 eggs and 15 cups of cream. You have in stock 3380 eggs and 5190 cups of cream. You make a profit of \$2.25 from each gallon of Vanilla Bean and \$1.75 from each gallon of Double Chocolate. Use the method of linear programming to determine your maximum profit.

ANSWER: \$_____

4. (18 points) The formulas for two functions $f(x)$ and $g(x)$ are:

$$f(x) = 5x^2 + 66.25x \text{ and } g(x) = \frac{5}{3}x^3 - 30x^2 + 160x + 4.$$

- (a) Find all values of x at which the graph of $g(x)$ has a horizontal tangent line.

ANSWER: $x =$ _____ (list all)

- (b) Give the longest interval on which $g(x)$ is decreasing and $f(x)$ is increasing.

ANSWER: from $x =$ _____ to $x =$ _____

- (c) Find the value of x on the interval from $x = 0$ to $x = 10$ at which $f(x)$ is smallest.

ANSWER: $x =$ _____

- (d) Compute $\int_0^b f'(x) dx$.

ANSWER: _____

- (e) Find the longest interval, starting at $x = 0$, on which $g(x)$ is concave down.

ANSWER: from $x =$ _____ to $x =$ _____

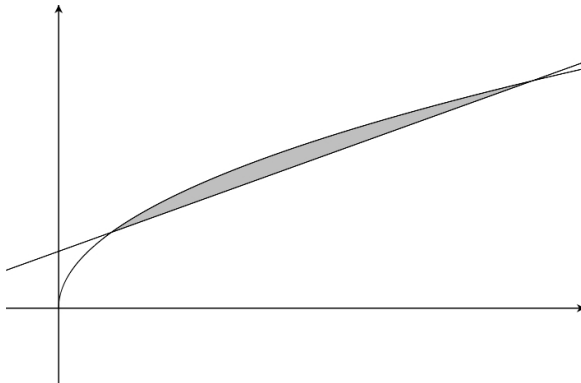
5. (18 points)

(a) Compute $\int \frac{8}{\sqrt{t}} + \frac{6}{\sqrt[3]{t}} + \frac{9}{5t} dt$.

ANSWER: _____

(b) Compute $\int_1^4 6x^2 - 10x dx$.

ANSWER: _____

(c) The shaded region is between the graphs of $y = \sqrt{x}$ and $y = \frac{1}{4}x + \frac{3}{4}$.

Find the area of the shaded region.

ANSWER: _____

6. (12 points)

(a) Compute $\frac{dy}{dx}$ if $y = \frac{4xe^x - \ln(x^2 + 3)}{x^5}$. (Do not simplify.)

(b) Compute $\frac{\partial z}{\partial y}$ if $z = 14 + xy + \frac{9e^y}{x} - \frac{8e^x}{y}$. (Do not simplify.)

(c) Compute $f'(m)$ if

$$f(m+h) - f(m) = \frac{-13h}{(7+m+h)(7+m)}.$$