

MATH 112
Exam I
February 3, 2009

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: _____

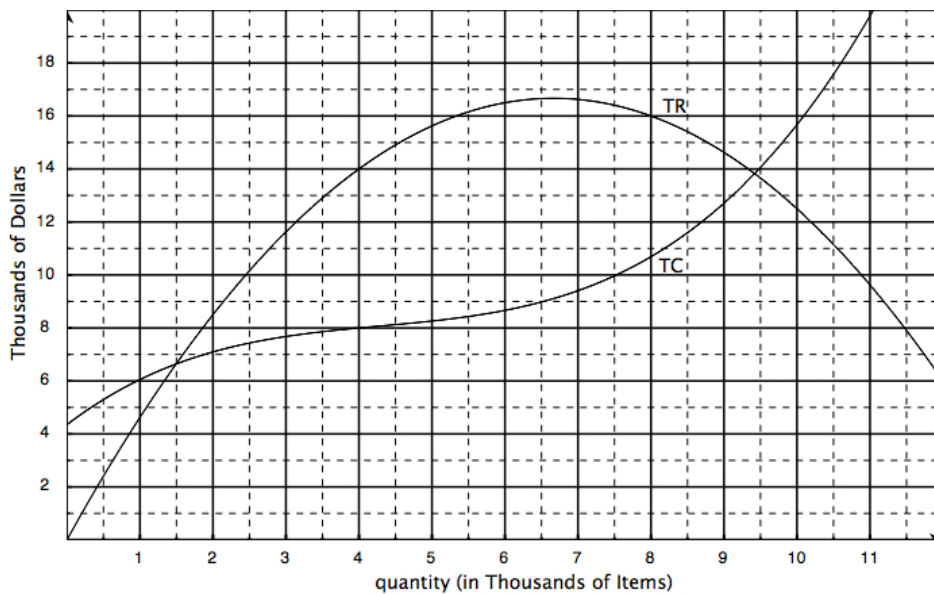
1	6	
2	14	
3	14	
4	16	
Total	50	

- Please check that your exam contains 4 problems.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. Clearly label lines and points that you are using and show all calculations. 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.

GOOD LUCK!

1. (6 points) Find $f'(x)$ if $f(x) = x \left(3 + \sqrt{x} + \frac{5}{\sqrt[3]{x^2}} \right)$.

2. (14 points) Below are the graphs of total revenue (TR) and total cost (TC) for selling Items.



- (a) What is the cost of producing one more Item if you have already produced 6 Thousand Items? Include units with your answer.

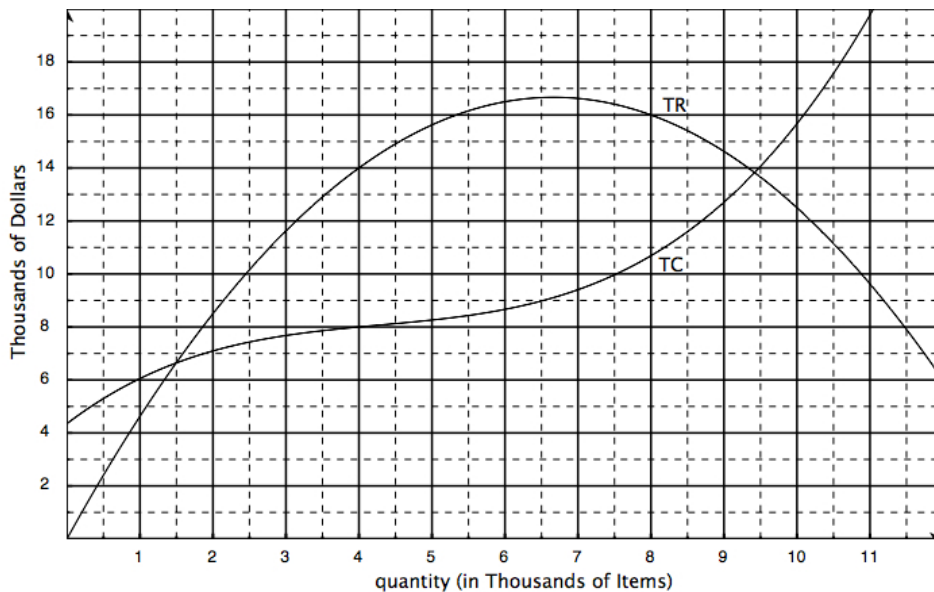
ANSWER: _____; UNITS: _____

- (b) Find a quantity at which marginal revenue is \$3 per Item.

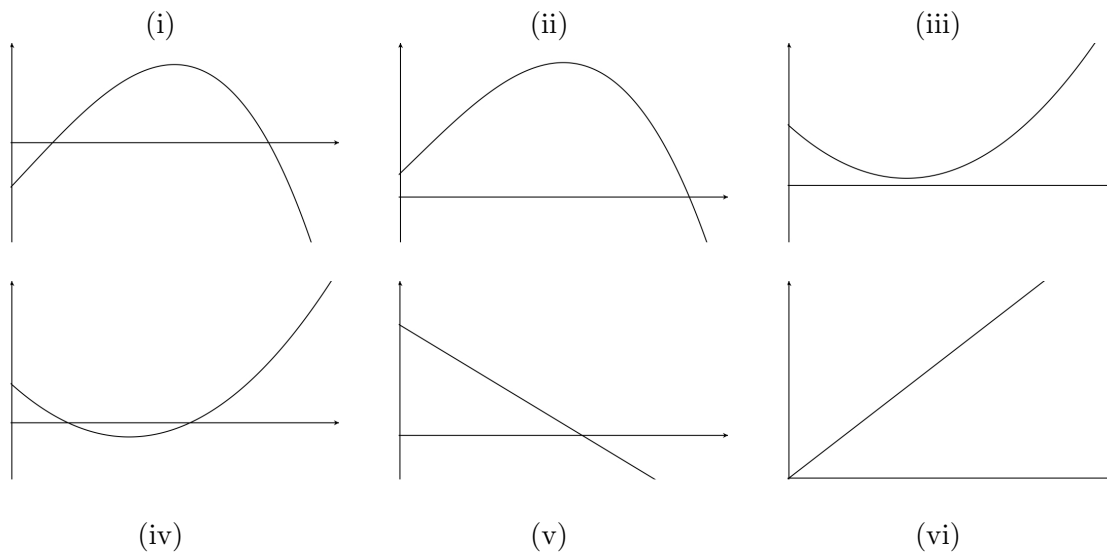
ANSWER: $q =$ _____ thousand Items

(THIS PROBLEM CONTINUES ON THE NEXT PAGE.)

Here are the graphs of TR and TC again.



(c) Consider the following graphs.



Which graph could be:

- the graph of marginal revenue (MR)? ANSWER: _____
- the graph of marginal cost (MC)? ANSWER: _____
- the graph of profit? ANSWER: _____
- the **derived graph** of variable cost? ANSWER: _____

3. (14 points) Suppose you are not given the formula for a function $K(x)$, but you are told instead that

$$K(a+h) - K(a) = \frac{4h}{(5-a-h)(5-a)}.$$

- (a) Compute $K(1.02) - K(1)$.

ANSWER: _____

- (b) Write out a formula, in terms of r , for the slope of the secant line through the graph of $K(x)$ at $x = r$ and $x = r + 0.04$.

ANSWER: _____

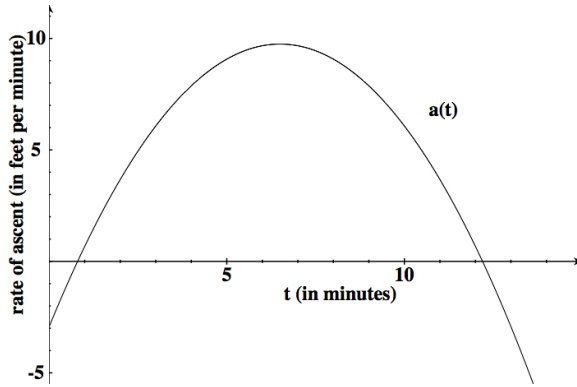
- (c) Write out the formula for $K'(a)$.

ANSWER: _____

- (d) Find a value of a that satisfies the following: The tangent line to $K(x)$ at $x = a$ is parallel to the line $y = 64x + 5$.

ANSWER: $a =$ _____

4. (16 points) At $t = 0$, Balloon A is 100 feet above the ground. Its rate of ascent (in feet per minute) at t minutes is $a(t) = -0.3t^2 + 3.9t - 2.928$. A sketch of $a(t)$ is shown below.



- (a) Find the longest interval over which Balloon A is rising.

ANSWER: from $t =$ _____ to $t =$ _____ minutes

- (b) The altitude (in feet) of Balloon B at t minutes is $B(t) = 0.2t^2 - 3.2t + 100$. Give the formula for $b(t)$, the rate of ascent of Balloon B .

ANSWER: $b(t) =$ _____

- (c) How fast is Balloon A moving when Balloon B is at its lowest altitude?

ANSWER: _____ feet per minute

- (d) Find the time at which Balloon A is rising fastest.

ANSWER: $t =$ _____ minutes