

MATH 111
Final Exam
Winter 2015

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.”

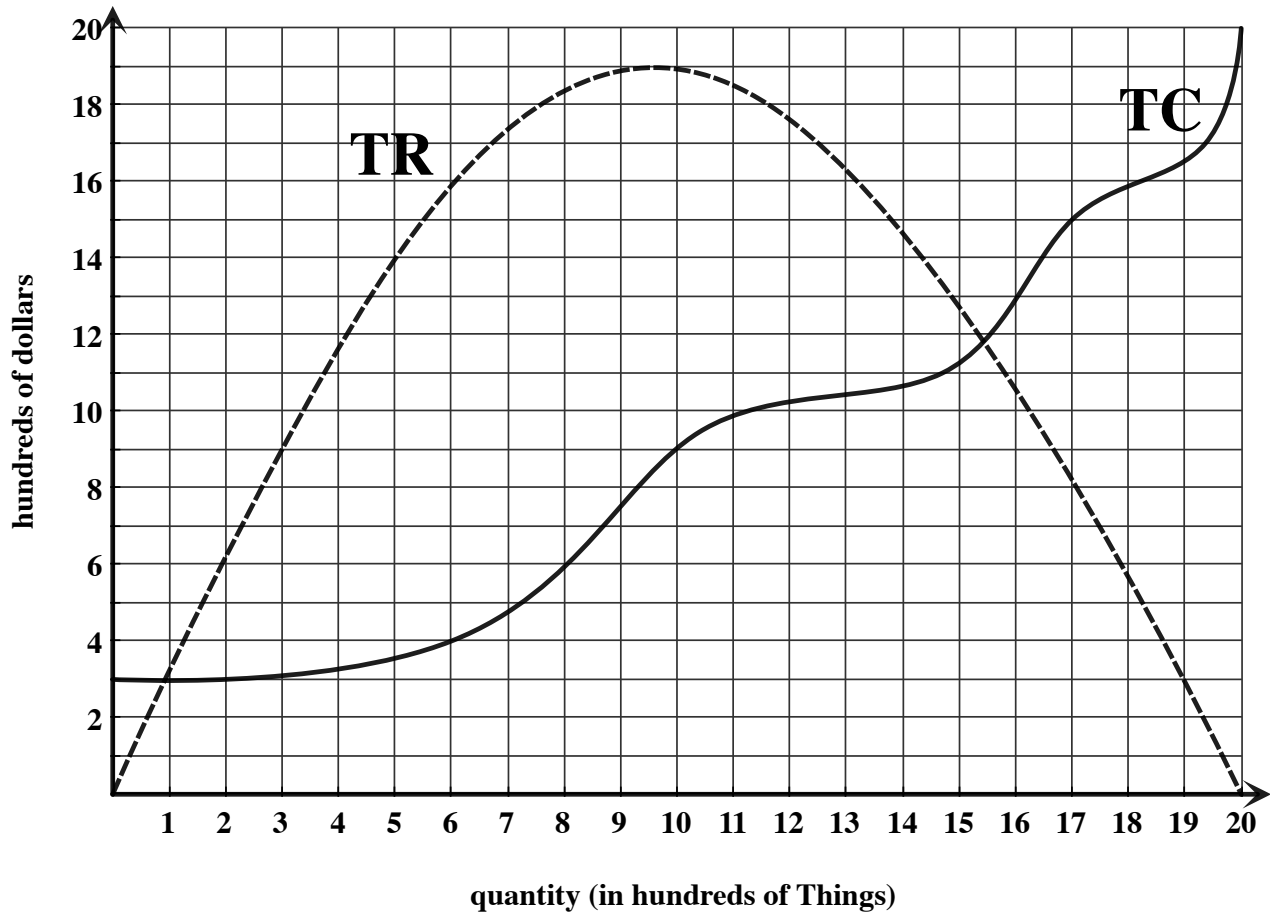
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1	15	
2	12	
3	16	
4	17	
5	15	
6	15	
7	10	
Total	100	

- This exam consists of this cover sheet followed by 7 problems on 7 pages. Please check that you have a complete exam.
- You are allowed to use a scientific, non-graphing, non-programmable calculator and one sheet of hand-written notes during this exam. The use of all other sources is prohibited.
- Turn your cell phone OFF and put it away for the duration of the exam.
- You may not listen to headphones or earbuds during the exam.
- Unless otherwise indicated, you must show your work or write a few words to justify your answers. Clearly show all calculations. The correct answer with no supporting work may result in no credit.
- On problems that require you to work with a graph, show your work clearly by marking all lines and points that you use.
- If you use a guess-and-check method when an algebraic method is available, you may not receive full credit.
- Unless otherwise specified, you may round your **final answer** to two digits after the decimal.

GOOD LUCK!

1. (15 points) The following shows the graphs of total revenue (TR) and total cost (TC) for selling Things. Notice the units on the axes.



- (a) What is the largest value of total revenue?

ANSWER: _____ hundred dollars

- (b) What is the break even price?

ANSWER: _____ dollars per Thing

- (c) If 650 Things are sold, what is the profit?

ANSWER: _____ hundred dollars

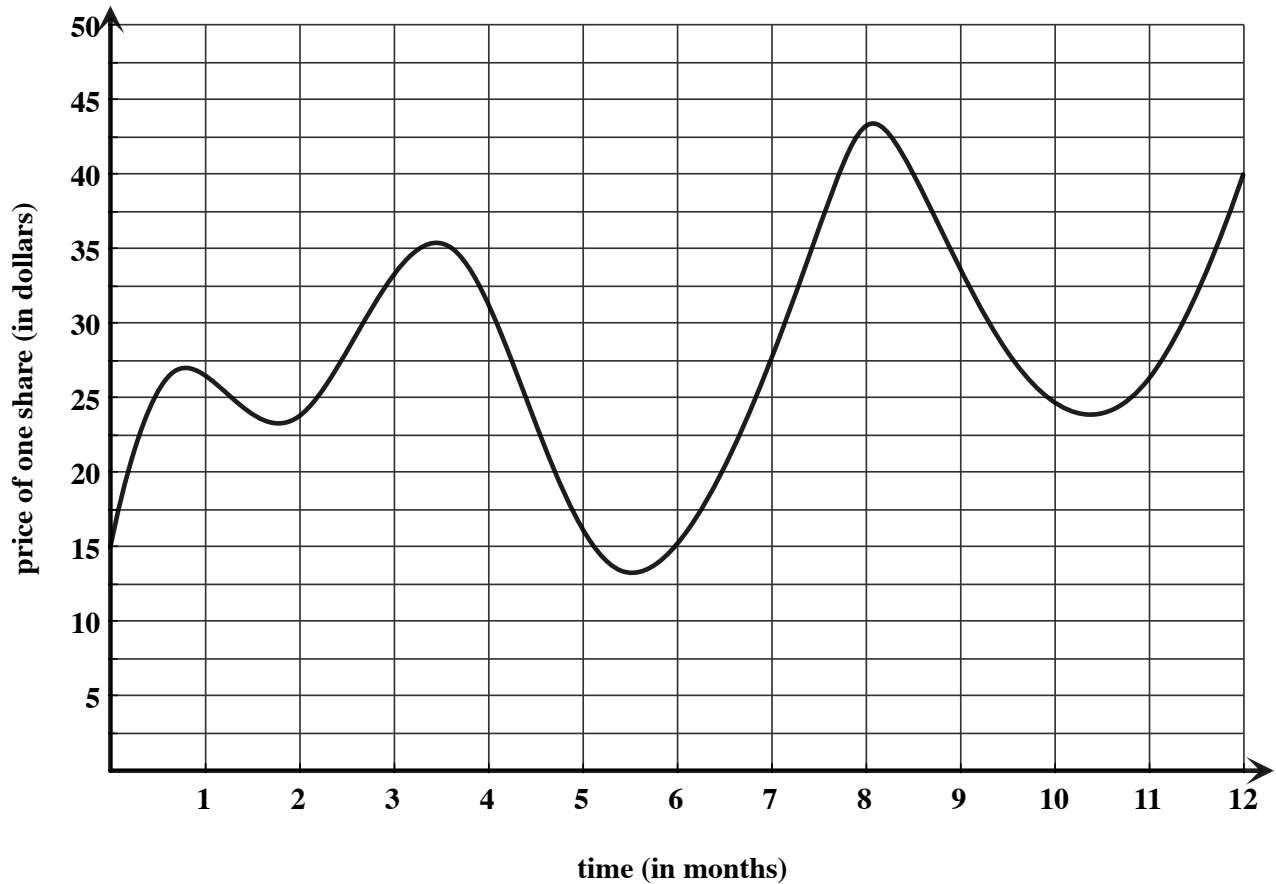
- (d) What is the average variable cost (AVC) to produce 1000 Things?

ANSWER: _____ dollars per Thing

- (e) Find all quantities at which marginal revenue (MR) is \$0.50 per Thing.

ANSWER: (list all) $q =$ _____ hundred Things

2. (12 points) The following shows the price of one share of stock of the ABC Corporation during a twelve-month period. Note that the price of the stock at $t = 0$ is \$15.



- (a) What is the average rate of change of the price of one share of stock from $t = 1$ to $t = 12$ months?

ANSWER: _____ dollars per month

- (b) Find all times at which the overall rate of change of the stock is \$5.00 per month.

ANSWER: (list all) $t =$ _____ months

- (c) Give a one-month interval during which the price of one share of stock grew by \$2.50.

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

3. (16 points) Adriana and Benedict run along a long straight trail. Distance traveled (in feet) at time t seconds for each is given by a quadratic function.

$$\text{Adriana : } A(t) = 15t - 0.5t^2$$

$$\text{Benedict : } B(t) = 0.2t^2 + 4.5t$$

- (a) Find two times when Adriana is ahead of Benedict by 20 feet.

ANSWER: $t =$ _____ and $t =$ _____ seconds

- (b) When is Adriana ahead of Benedict by the largest distance?

ANSWER: $t =$ _____ seconds

- (c) Find the formula for Adriana's average speed during the 5-second interval beginning at time t . Simplify as much as possible and place a box around your final answer.

- (d) Find the time at which Benedict's average trip speed is exactly 6.78 feet per second.

ANSWER: $t =$ _____ seconds

4. (17 points) You sell Items on a sliding price scale. The price per item (in dollars) for q Items is given by the function

$$p = -1.5625q + 89.$$

The total cost function $TC(q)$ is **linear**. When you produce 8 Items, total cost is \$612; when you produce 40 Items, total cost is \$1060.

- (a) Find formulas for total revenue and total cost.

ANSWER: $TR(q) =$ _____

$TC(q) =$ _____

- (b) Find all quantities at which you break even.

ANSWER: (list all) $q =$ _____ Items

- (c) Compute marginal revenue (MR) at $q = 22$ Items.

ANSWER: _____ dollars per Item

- (d) What is the maximum possible profit?

ANSWER: _____ dollars

5. (15 points)

- (a) Sam borrows \$1200 from a friend to buy a guitar. The friend charges Sam **simple interest** of 1.75% per year. Sam repays the friend in **one payment** of \$1248.30. How long did it take Sam to repay the loan?

ANSWER: _____ years

- (b) Valerie borrows money to buy a house, taking out a loan charging 5.1%, compounded monthly, with payments amortized over 30 years. Her monthly payments are \$1700.

i. How much did Valerie borrow? (Round to the nearest **dollar**.)

ANSWER: \$ _____

- ii. If she makes payments for the full 30-year life of the loan, how much interest will she pay?

ANSWER: \$ _____

- iii. If, instead, Valerie makes her monthly payments of \$1700 for 22 years and then immediately pays off the loan, how much interest will she pay? (Round to the nearest **dollar**.)

ANSWER: \$ _____

6. (15 points) Bart and Lisa have bank accounts.

Bart's account earns 4.2% interest, compounded daily ($m = 360$ times a year).

Lisa's account earns 4.15%, compounded continuously.

(a) Compute the APY for each account.

ANSWER: Bart's APY is _____% Lisa's APY is _____%

(b) If Bart makes a one-time deposit of \$663, when will his balance be \$670?

ANSWER: $t =$ _____ years

(c) What is the percent change in Lisa's balance over any 15-month period?

ANSWER: _____%

(d) Maggie has an account with interest compounded quarterly. Maggie and Lisa each deposit \$100 in their respective accounts on the same day. Two years later, Maggie's balance is \$50 more than Lisa's. What is the interest rate on Maggie's account?

ANSWER: _____%

7. (10 points)

- (a) Felix wins \$450,000 in an insurance settlement and uses this money to set up an annuity that earns 6%, compounded monthly. Felix withdraws \$3000 at the end of each month from the annuity. How many payments can Felix withdraw? (Round your answer UP to the nearest whole number.)

ANSWER: _____ payments

- (b) On the day her niece was born, Olivia set up an annuity to help her pay for college. Olivia makes payments at the beginning of each quarter into an annuity paying 2.6%, compounded quarterly. How large must Olivia's quarterly payments be in order to have \$48,000 after 18 years?

ANSWER: \$ _____