

MATH 111
Final Exam
Winter 2016

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.”

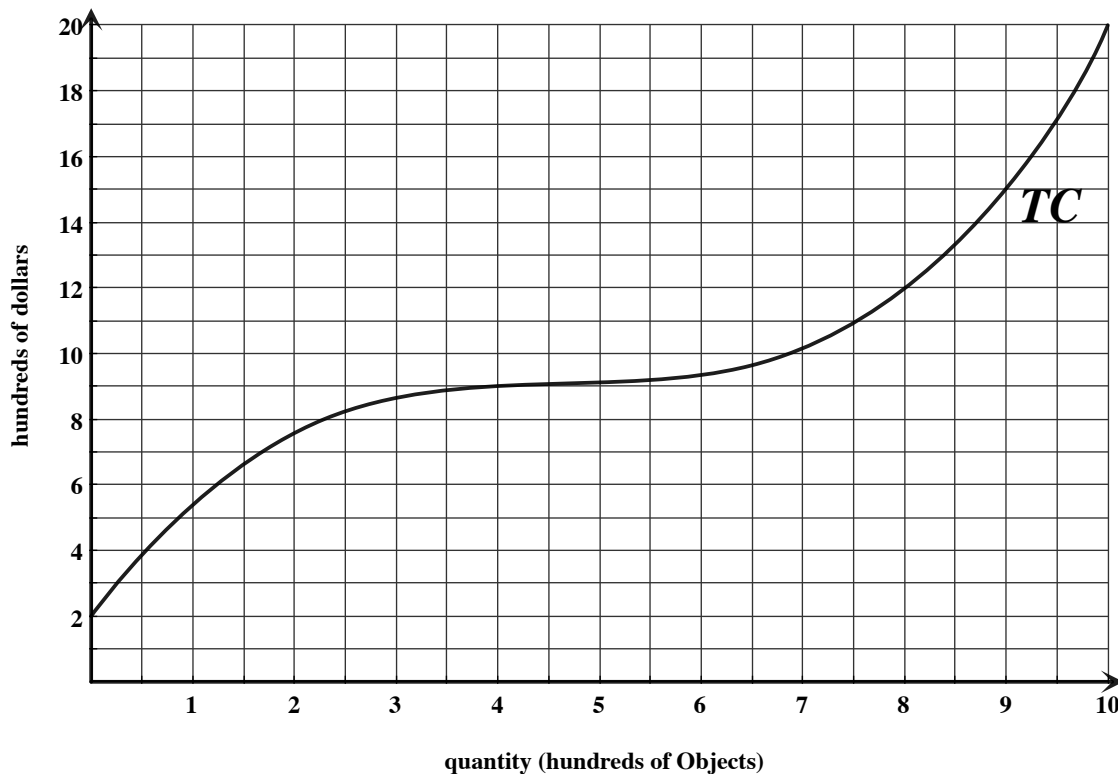
SIGNATURE: _____

1	16	
2	10	
3	19	
4	12	
5	15	
6	18	
7	10	
Total	100	

- Check that your exam contains this cover sheet followed by 7 problems.
- You are allowed to use a TI30X-IIs calculator, a ruler, and one sheet of hand-written notes. All other sources are forbidden.
- Do not use scratch paper. If you need more room, use the back of the page and indicate to the grader you have done so.
- 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.
- 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 when an algebraic method is available, you may not receive full credit.
- When rounding is necessary, you may round your final answer to two digits after the decimal.
- There are multiple versions of the exam, you have signed an honor statement, and cheating is a hassle for everyone involved. **DO NOT CHEAT.**
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (16 points) You sell Objects. The graph of total cost is given below. Notice the units on the axes.



- (a) Compute the variable cost to produce 400 Objects.

ANSWER: _____ hundred dollars

- (b) Compute the average cost to produce 125 Objects.

ANSWER: _____ dollars per Object

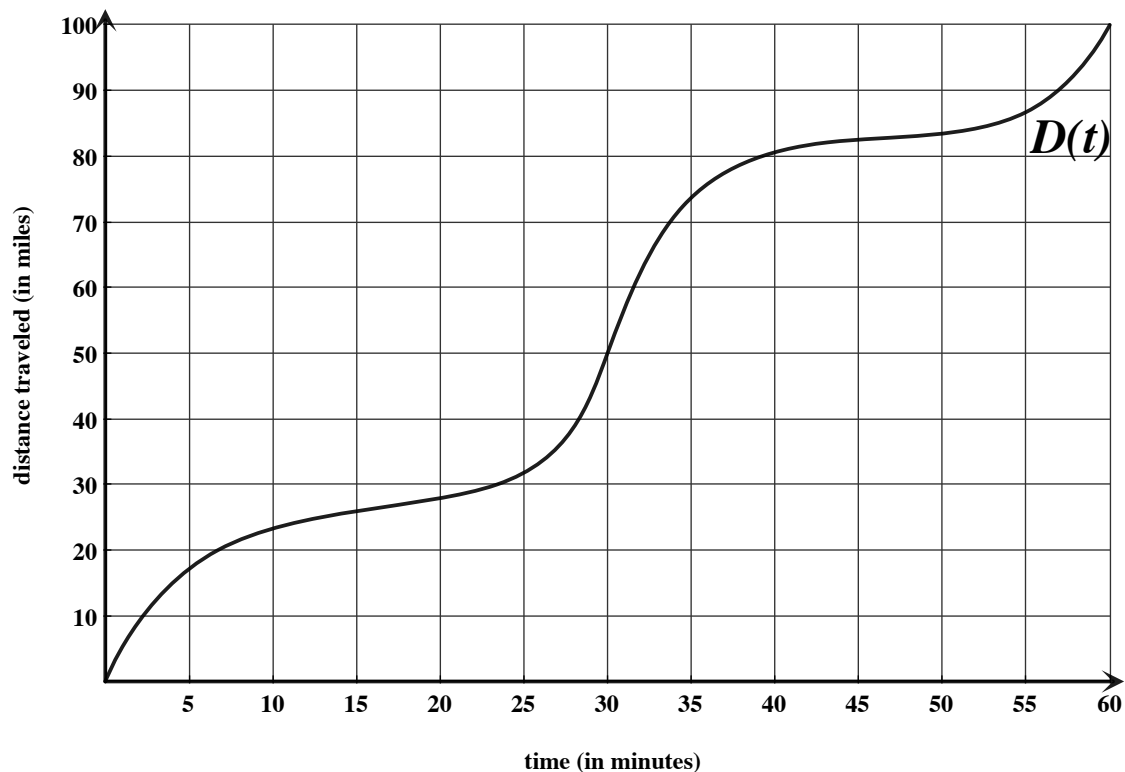
- (c) Find all values of q at which marginal cost is \$0.75 per Object.

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

- (d) Objects sell for \$2.00 each. Sketch the graph of TR on the axes above and find the longest interval of quantities on which profit is at least one hundred dollars.

ANSWER: from $q =$ _____ to $q =$ _____ hundred Objects

2. (10 points) The graph below shows the graph of the function $D(t)$, distance traveled versus time for a moving object.



Each of the following is the slope of a line on this graph:

- (a) the object's average trip speed at $t = 5$
- (b) the object's average speed during the 0.5-minute interval starting at $t = 45$
- (c) the smallest value of average trip speed
- (d) $\frac{D(31) - D(29)}{2}$

Instructions:

- On the axes above, draw the line with the given slope. Label each line with its corresponding letter: (a), (b), (c), or (d).
- List the items in order from smallest to largest slope.

YOU DO NOT NEED TO CALCULATE THE SLOPES.

Just place the letters (a), (b), (c), and (d) in order from smallest to largest slope.

ORDERED: (smallest) _____ (largest)

3. (19 points) You sell Things and you know the following formulas:

$$MR(q) = 100 - 2q \quad MC(q) = 0.9q^2 - 18q + 91 \quad AVC(q) = 0.3q^2 - 9q + 91.$$

(In each formula, q is measured in hundreds of Things, while MR , MC , and AVC are given in dollars per Thing.)

- (a) Compute the **change in total revenue** if quantity changes from 525 to 526 Things. Include units.

ANSWER: _____ UNITS: _____

- (b) Give the longest interval of quantities on which **profit** is increasing.

ANSWER: from $q =$ _____ to $q =$ _____ hundred Things

- (c) Compute the shutdown price.

ANSWER: _____ dollars per Thing

- (d) Find the longest interval of quantities on which **marginal cost** is increasing and **average variable cost** is decreasing.

ANSWER: from $q =$ _____ to $q =$ _____ hundred Things

4. (12 points)

- (a) Find the equilibrium quantity and equilibrium price if demand and supply for a commodity are:

$$\text{demand : } q(5p - 2) = 18616 \quad \text{supply : } p - q = 20.$$

ANSWER: $(q, p) =$ _____

- (b) Let $f(x) = -x^2 + 3x + 9$. Compute $\frac{f(x+h) - f(x)}{h}$ and simplify as much as possible.

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

5. (15 points)

- (a) Tien makes a one-time deposit of \$400 into an account that compounds quarterly. After 3 years, her balance is \$513. What is the annual interest rate?

ANSWER: _____%

- (b) Jonah receives a year-end bonus of \$18,000. If he invests it at 3.24%, compounded monthly, what size payments can he withdraw at the beginning of each month for the next year?

ANSWER: \$ _____

- (c) Grace makes payments of \$2500 at the end of every six months to an account paying 2.16%, compounded semi-annually. How many payments must she make before the balance in her account is \$60,000? (Round UP to the next whole payment.)

ANSWER: _____ payments

6. (18 points) Consider two accounts:

- Account *A*: 7.2%, compounded daily (use $m = 360$ for the number of days in a year)
- Account *B*: 7%, compounded continuously

(a) Compute the APY for each account.

ANSWER: Account *A*: _____%

Account *B*: _____%

(b) **Beginning today**, Claude will make payments of \$5 at the beginning of every day into Account *A* for 4 years. At the end of 4 years, he will deposit the entire balance into Account *B* **and stop making the daily payments**.

i. How much does Claude deposit into Account *B*?

ANSWER: \$ _____

ii. How many years **from now** will Claude's balance be \$42,000?

ANSWER: _____ years

iii. How much of the \$42,000 will be interest Claude earns?

ANSWER: \$ _____

7. (10 points) A physical therapist remodels her office by taking out a loan for \$65,000. The loan is paid back in quarterly payments over the next 6 years at an interest rate of 3.2%, compounded quarterly.

(a) Compute the size of the quarterly payments.

ANSWER: \$ _____

(b) How much interest does she pay over the life of the loan?

ANSWER: \$ _____