MATH 111
Final Exam
March 10, 2018

Name _____

Signature _____

Student ID #_____

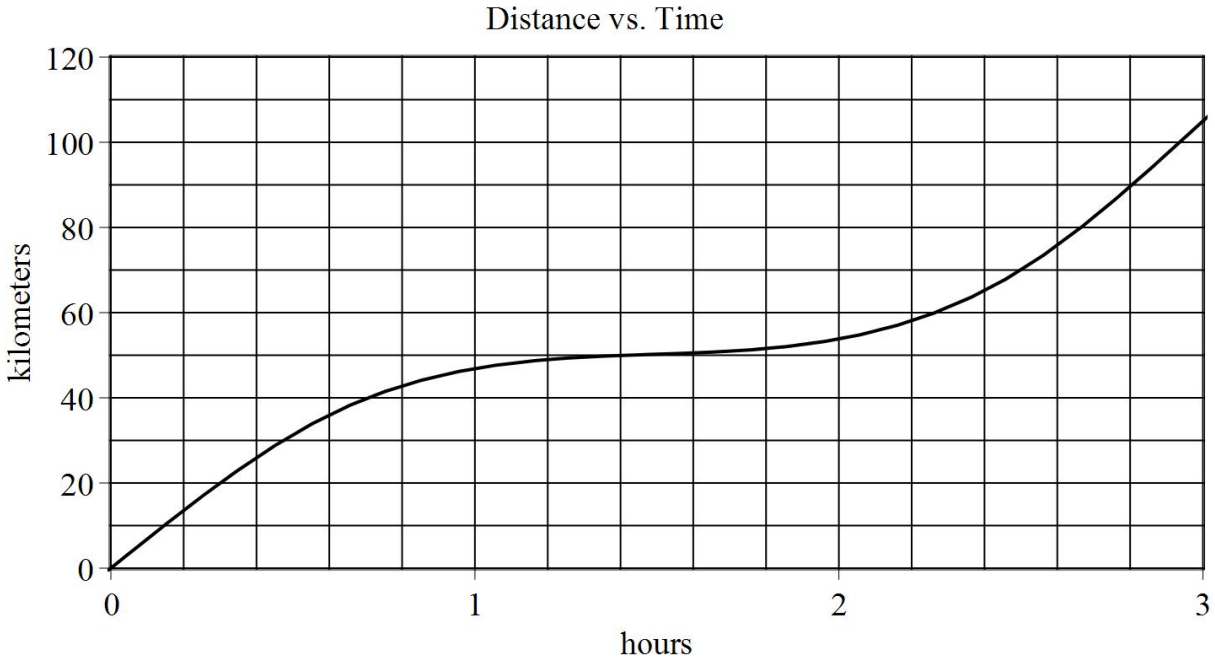
Section _____

1	12	
2	13	
3	13	
4	16	
5	9	
6	9	
7	12	
8	16	
Total	100	

- You are allowed to use a Ti-30x IIS Calculator, a ruler, and one hand-written 8.5 by 11 inch page of notes. If we see a different calculator model, we will take it from you and you can get it back from us at the end of the final.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- Unless otherwise indicated, you may round your final answer to two digits after the decimal.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- Raise your hand if you have a question.
- Any student found engaging in academic misconduct, even if the copying is only on one part of one problem, will receive a score of 0 on the entire exam and will be reported to the College for academic misconduct.
- You have 2 hours and 50 minutes to complete the exam.

GOOD LUCK!

1. Ernesto is riding his motorcycle on the Pan-American Highway going North from Valparaiso towards Lima. The distance of the car to Valparaiso is given by the following graph. Mark your lines with the letter of the question so we can follow your work while grading.



(a) (2 points) What is the lowest value of Ernesto's trip speed?

(b) (3 points) What is Ernesto's speed during the 156th minute?

(c) (2 points) Alberto starts riding north at the same time and place, but goes at a constant speed 35 kilometers per hour. Graph his distance function above. At what time(s) do they meet again?

(d) (3 points) At what time is Ernesto furthest ahead of Alberto? What is the maximum distance between them at that time?

(e) (2 points) Find two 48 minute intervals when the average speed of Ernesto is 35 kilometers per hour.

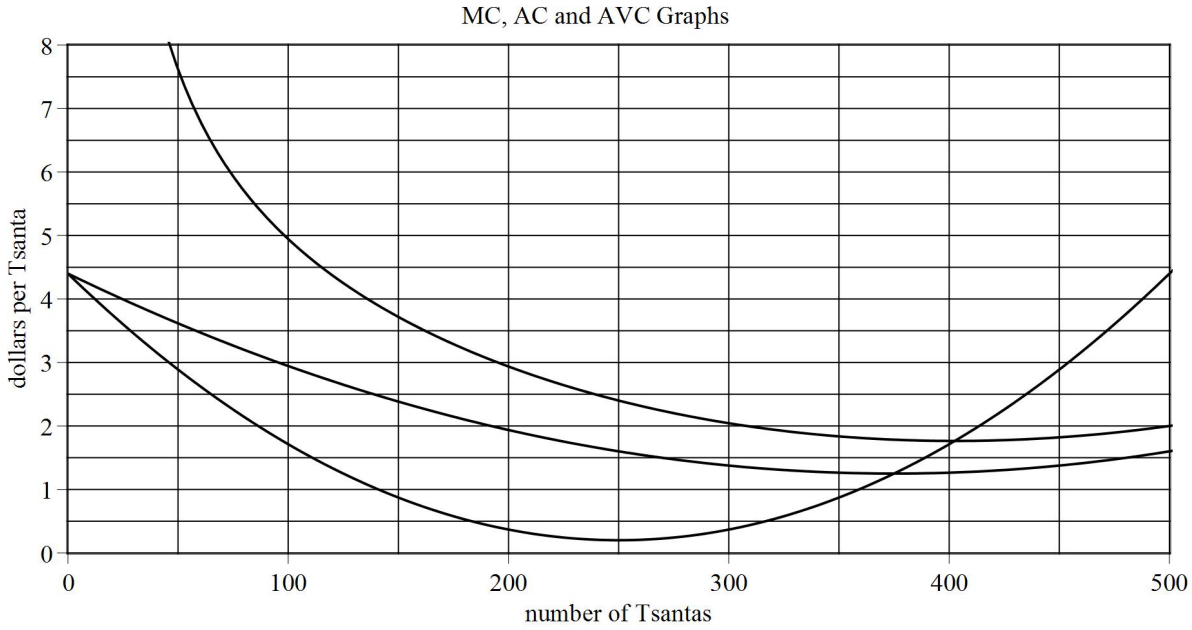
2. In the following unrelated questions, the total cost and total revenue are linear functions.

   (a) (5 points) You make sombreros. It costs \$790 to make 40 Sombreros and \$574 to make 24 Sombreros. You sell each for \$16. When do you break even?

   (b) (4 points) You make and sell Caretillas. It costs \$160 to make each Caretilla. You sell each for \$240. What is the fixed cost if you break even at 150 Caretillas?

   (c) (4 points) You make and sell Libros. Your fixed cost is \$620 and you sell them for \$7.75 each. If you break even at 400 Libros, what is your marginal cost?

3. You produce and sell Tsantas. The following are the graphs of Marginal Cost, Average Cost, and Average Variable Cost. You have to decide which one is which. Mark them on your graph before you get started.



(a) (2 points) What are the Shutdown and Breakeven prices?

(b) (5 points) What are the Total Cost and Variable Cost at 100 Tsantas? What is the Fixed Cost?

(c) (1 point) What is the cost of producing the 51st Tsanta?

(d) (1 point) What is the lowest value of marginal cost?

(e) (4 points) If you sell each Tsanta for \$2.50, what is the maximum profit? At what quantity do you make the maximum profit?

4. You produce and sell Koupas. The total revenue and average cost at q **hundred Koupas** are given by:

$TR(q) = 39q - q^2$ **hundreds of dollars** $AC(q) = 1.5 + 5q + \dfrac{22.65}{q}$ **dollars per Koupa**

(a) (2 points) Find the marginal cost $MC(q) =$ _____ dollars per Koupa.

(b) (6 points) Find the quantity when you have a loss of $2500. Round your answer to the nearest Koupa and include units.

(c) (4 points) Find the maximum profit. Round your answer to the nearest cent and include units.

(d) (4 points) Find the breakeven price. Round your answer to the nearest cent and include units.

5. The wholesaler sells tulip bulbs in bags of 100 bulbs each. Oriental gardens will buy 40 bags if the price is \$37 per bag and 20 bags if the price is \$45 per bag.
   The wholesaler's supply function was $p = 0.02q^2 + 12$, where q is the number of bags of tulips, but then a \$2.50 tax per bag was imposed.

   (a) (4 points) Find the equation of the linear demand function in terms of the price p and the quantity q.

   (b) (5 points) Find the supply function after tax and the equilibrium point for this tulip bulb market.

6. A bacteria colony triples its population every 90 minutes and there are currently 7500 bacteria in the colony. You can model the population of the bacteria by an exponential function. Round your answers to the nearest bacteria or the nearest tenth of a minute.

   (a) (3 points) What will the population be 3 hours from now? Round your answer to the nearest bacteria.

   (b) (3 points) What is the percentage change in the population over a one-hour period?

   (c) (3 points) How long does it take for the population to double? Give your answer in minutes and round to the nearest minute.

7. The two parts of this question are unrelated.

   (a) (6 points) If you are going to take out a loan to pay back in full at the end of a three years, which one of the three options would you chose?

   Bank of A - 6.8% annual simple interest.
   Bank of B - 6.22% annual interest compounded monthly.
   Bank of C - 6.15% annual interest compounded continuously.

   (b) (6 points) You take a loan of $\$400,000$ to buy a Lamborghini Aventador to pay back in monthly installments of $\$5,000$ at 4.8% annual interest compounded monthly. How long will it take for you to pay off your loan?

8. Grandma started saving for retirement at age 25 by sending \$150 at the end of every month to an investment account with 5.4% annual interest compounded monthly. At the age of 65, she retired and stopped sending money to the account, but kept her money there. Twelve years after she stopped sending money to the account, her twin grandchildren started college. So, she used some of those savings to send money to both her grandkids, $\$1,250$ each, at the beginning of each month for the next 10 years, until they finished graduate school.

   (a) (5 points) How much did she have in her account when she retired?

   (b) (4 points) How much did she have in her account when her grandchildren started college?

   (c) (7 points) How much money does she have left in her account when her grandchildren finish graduate school, assuming she does not make any other withdrawals from the account?