MATH 111
Final Exam
March 16, 2019

Name _____

Signature _____

Student ID #_____

Section _____

1	12	
2	13	
3	13	
4	13	
5	11	
6	12	
7	16	
8	10	
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.

- 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. The following is a graph showing Total Cost and Variable Cost for producing Quebees. Label the lines you draw on your graph with the letter of the question so we can follow your work. Give **units** for your answers. Note the units on the graph.

Total Cost and Variable Cost for Producing Quebees
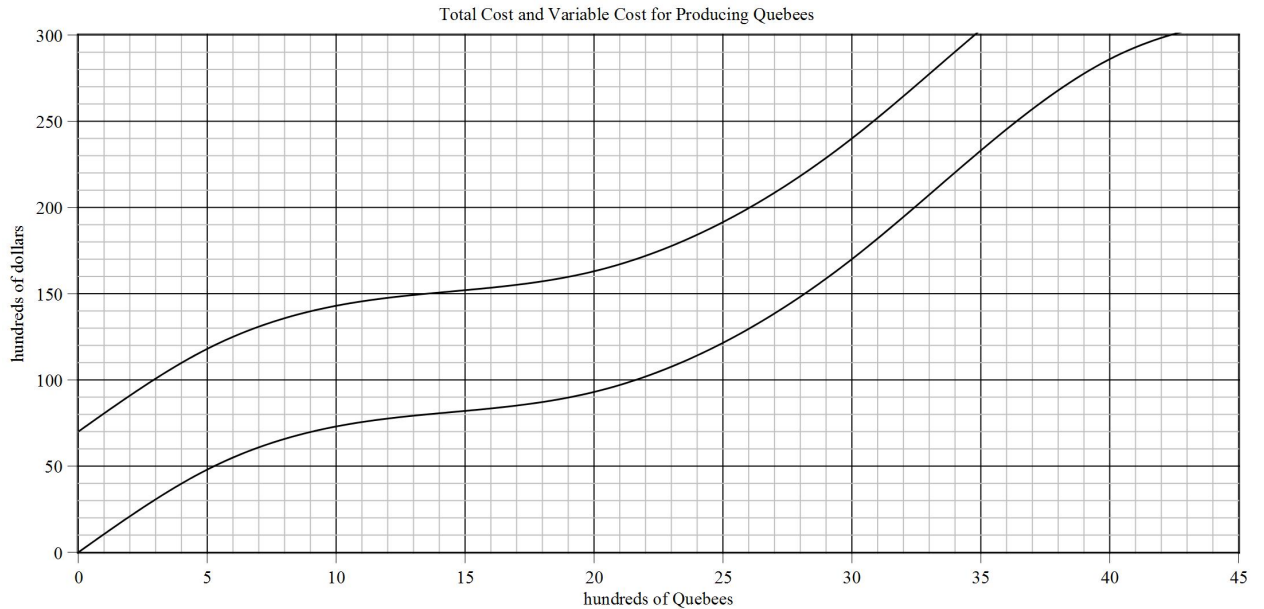
(a) (2 points) What is the Average Variable Cost at 7 hundred Quebees?

(b) (2 points) What is the Total Cost of producing 4000 Quebees?

(c) (2 points) What is the cost of producing the 3001st Quebee?

(d) (6 points) If you sell each Quebee at the Breakeven Price, what is your maximum profit? What is your maximum loss?

2. The Total Cost of producing Things is given by

$$TC(q) = 0.006q^3 - 0.42q^2 + 16q + 43$$

dollars where q is the quantity of Things.

(a) (2 points) What is the Average Cost of producing 25 Things?

(b) (3 points) At what quantity q will the Average Variable Cost will be $8.95 per Thing?

(c) (3 points) Very carefully find the formula for the Marginal Cost.

(d) (5 points) If you sell each Thing for $12.14, what is your maximum profit?

3. Mayzie the bird flies takes off the tree and lands on the ground. Her altitude in meters as a function of time in seconds is given by the quadratic function

$$h(t) = -0.4t^2 + 3.6t + 3.9.$$

   (a) (1 point) How tall is the tree?

   (b) (2 points) What is the maximum altitude of Mayzie?

   (c) (2 points) What is the average rate of change of her altitude between $t = 3$ and $t = 3.5$ seconds?

   (d) (2 points) Find a time when her overall rate of change in altitude is 2.6 meters per second.
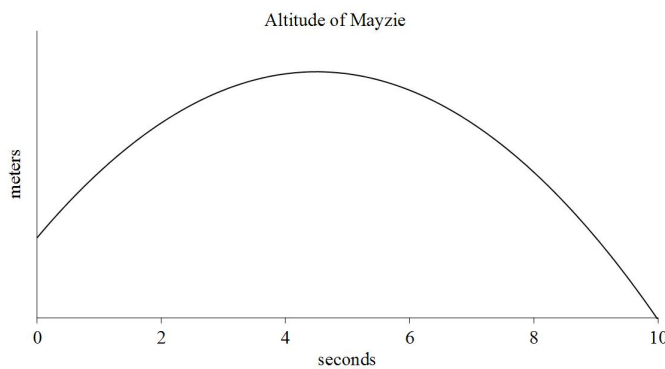
Altitude of Mayzie

   (e) (4 points) On the left is the graph of the altitude of Mayzie as a function of time. Mark your answers to the questions above on the graph with letters (a)-(d) as if you were solving the same questions from the graph.

   (f) (2 points) Compute algebraically the time when she lands on the ground. Compare with the graph to verify your answer.

4. Solve the following algebraic equations for x.

(a) (5 points) $\dfrac{3}{x-2} + \dfrac{1}{2} = -\dfrac{1}{2x+1}$

(b) (4 points) $\dfrac{5 - \ln(1+2x)}{3} = 1.1.$

(c) (4 points) $\dfrac{3}{1 - 2e^{-3t}} = 4$

5. Handmade colorful hammocks are very popular in Etsy. The demand function is given by the quadratic

$$p = -0.01q^2 - 0.1q + 62.5$$

where p is the price per hammock in dollars and q is the quantity. The supply function is linear. A popular Etsy merchant, Latin Handcrafts will produce 50 hammocks if the market price is 27 dollars per hammock and 75 hammocks if the price is 32 dollars per hammock.

(a) (8 points) Find the equilibrium price and quantity. Round your answer to the nearest hammock and the nearest dollar.

(b) (3 points) On the right is the graph of the demand function. Graph the supply you found in part (a) on the graph. A tax of 5 dollars is imposed on each hammock. Graph the new supply function and estimate the new equilibrium quantity **using the graph**.
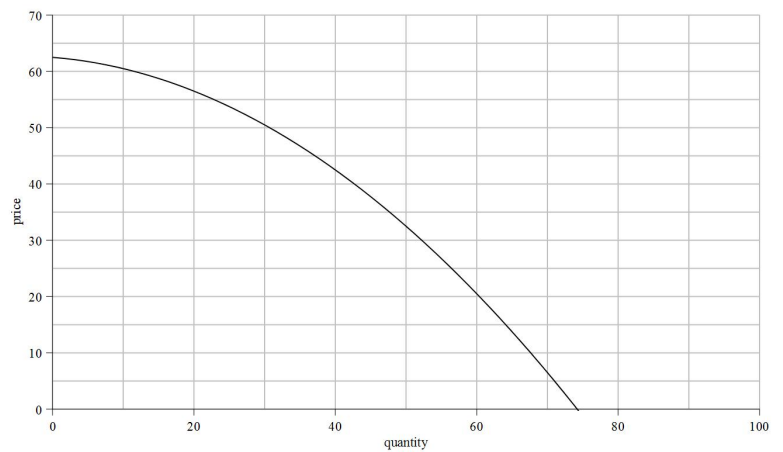
6. (12 points) Charlie is producing two types of chocolate at his factory. His White Chocolates have 20% cocoa butter and 55% sugar. His Dark Chocolates have 35% cocoa solids, 15% cocoa butter and 30% sugar. He has 600 pounds of cocoa butter. He needs to order the cocoa solids from a producer in Ghana who requires a minimum order of 210 pounds to make a shipment. His sugar order from Brazil should be at least 660 pounds. If he makes a profit of $5 on every pound of White Chocolate and $18 on every pound of Dark Chocolate, what production level will maximize his profits?
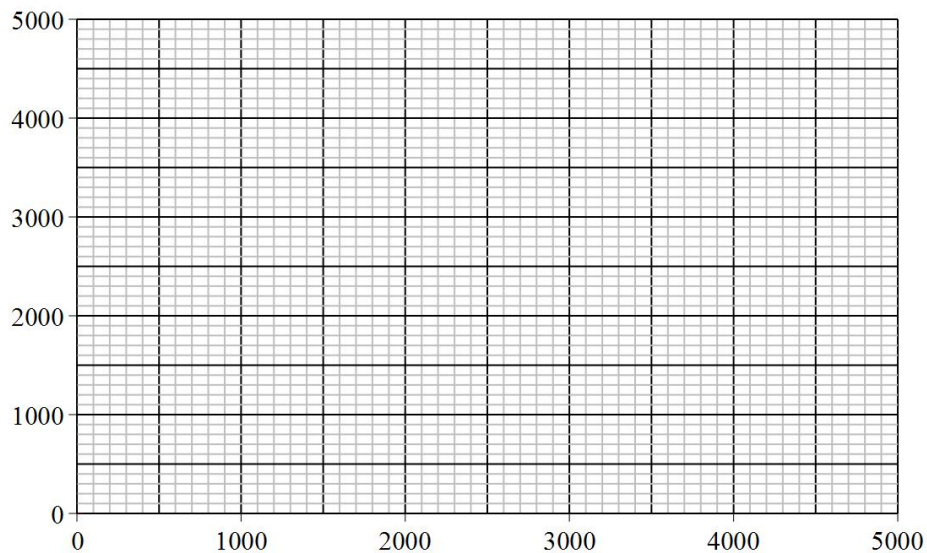
Would you say white chocolate is still chocolate?

7. (16 points) Michelangelo just landed the commission for the Sistine Chapel. The work will take four years. Vatican will pay for the expenses like paint and assistant salaries. He has to decide how he will get paid for his design, planning and painting. As he gets paid, he can invest his money at the Merchant of Venice Bank in an account with %2.7 annual interest compounded monthly. Which of the following payment options should he choose? (He already has money to support himself during this project so would not mind not getting paid at first as in the second case.)

   (a) He will be paid 15,000 Ducats at the beginning of the job.

   (b) He will be paid 16,800 Ducats at the end of the job.

   (c) He will get three payments of 5,300 Ducats at the beginning, middle and end of the four years.

   (d) He will get a monthly salary of 335 Ducats at the end of each month during the four years he works.

8. Your awesome grandma has decided to use part of her retirement savings to help you through college. You will show your gratitude by taking her on a trip to Europe.

   (a) (5 points) Her money is in an account which has 3.4% interest compounded monthly. She has dedicated $28,000 of her savings the day you start college to send you monthly money at the end of each month for the 45 months you are enrolled in college. How much money do you get from her every month?

   (b) (5 points) Finishing college, you get your first job. In order to take you grandmother to her native Krokazia, you start putting away $450 at the beginning of every quarter in an account with 4.2% annual interest compounded quarterly for 5 years. How much money do you end up with at the end of the 5 years for your trip?