MATH 105: Finite Mathematics

Semester 181
Major Exam One
Tuesday, October 2, 2018
Allowed time 75 minutes

Name: Student ID#:

Serial #:

Directions:
1) You must **show all your work** to obtain full credit.
2) You are allowed to use electronic calculators and other reasonable writing accessories that help write the exam.
3) Do not keep your mobile with you during the exam, turn off your mobile and leave it aside.

Question No	Full Marks	Marks Obtained
1	14	
2	6	
3	5	
4	7	
5	7	
6	11	
Total	50	

1. A manufacturer of a laser jet printer has a monthly fixed cost of $50,000, a production cost of $150 per unit, and a selling price of $200 per unit.
a. To earn a profit of $20,000 how many units must be produced? (3 points)

b. At what level of production will there be a loss of 20,000 dollars? (3 points)

c. What will be the profit of the company if the company produces 1,200 units? (3 points)

d. Find the break-even quantity. (2 points)

e. What will be the minimum number of units produced to earn a profit no less than $25,000? (3 points)

2. Abdulrahman has a total of $5,000 savings and he wants to invest this money in two businesses. One business pays profit at the rate of 6.5% per year, whereas the other business pays profit at the rate of 7.25% per year. If Abdulrahman earned a total profit of $330.45 in a single year, how much does he invested in each business? (6 points).

3. The demand function for an electronic company's two-in-one tablet computers is $p = 2400 - 6q$, where p is the price in dollars per unit when q units are demanded per week by consumers. Find the level of production that will maximize the manufacturer's total revenue, and determine this revenue. (5 points).

4. A medical company estimates its supply and demand equations for a certain medicine product by

$$p = \frac{3}{200}q + 9$$

$$and \quad p = -\frac{3}{100}q + 18$$

respectively, where $p \geq 0$ represents the price per unit in dollars and $q \geq 0$ represents the number of units sold per time period.

a) Find the equilibrium price. (3 points)

b) If a tax of 25 cents per unit is imposed on the supplier, find the new equilibrium price. What is the difference in price before and after the subsidy? (4 points)

5. Use the method of elimination only (by addition or by substitution) to solve the following two systems of equation:

a.
$$x + y + z = -1$$
$$3x + y + z = 1 \quad \text{(4 points)}$$
$$4x - 2y + 2z = 0$$

b.
$$x^2 + y^2 + 2xy = 1$$
$$2x - y = 2 \quad \text{(3 points)}$$

6. A manufacturer produces three products: A, B, and C. The profits for each unit of A, B, and C sold are $1, $2, and $3, respectively. The costs of producing each unit of A, B, and C are $4, $5, and $7, respectively. Next year, a total of 11 thousand units of all three products is to be produced and sold, with a variable cost of $63 thousand and a total profit of $25 thousand is to be realized. Let x, y, and z be the number of units (in thousands) produced for A, B, and C, respectively.

a) Model the problem by a system of linear equations, and write its augmented coefficient matrix. (4 points)

b) Write the matrix in the reduced form. Show your steps on the last page and here only write the reduced matrix. (5 points)

c) Make a short recommendation indicating how many units, of each of the three products, should be produced next year. (2 points)