Prince Sultan University

Department of Mathematical Sciences

Major I Exam

Semester I, 2014 SPRING (142)

MARCH 05, 2015

MATH 101 – Finite Mathematics

Time Allowed : 90 minutes
Maximum Points: 100 points

Name of the student:_____

ID number :_____

Section : _____ **Instructor's Name** _____

Important Instructions:

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 10 problems, some with several parts and a total of 6 pages. Make sure your paper has all these problems.

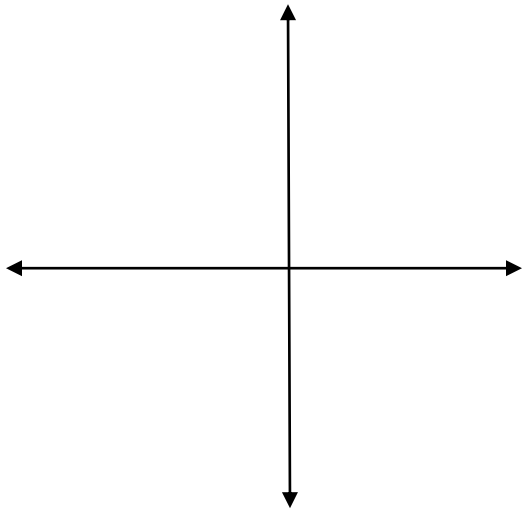
Question	Maximum score	Your Score
Q.1 , Q.2 , Q.3	21	
Q.4 , Q.5	14	
Q.6 , Q.7	15	
Q.8 , Q.9	18	
Q.10	12	
Total	**80**	

20

Q.1 (8 points) (i) Write an **equation of the line** for the following cases:

a) the line is passing through $(2,-5)$ and is parallel to the line: $3x-4y-6=0$

b) the line is passing through $(3,5)$ with $y-$intercept equal to -1 .



(ii) **Graph** the line: $-2x+4y-8=0$ showing x and $y-$intercepts .

Q.2 (5 points) Determine whether the given pair of lines are parallel, coincident, or intersecting.
(**Show your work and Give the reason)**

$L: x+2y=-12$

$M: -4x-8y=48$

Q.3 (8 points) The market price for a certain product is $\$12$ per unit and occurs when 300 units are produced. At a price of $\$9$, no units are produced, and, at a price of $\$16$, no units are purchased. Find the **supply and demand equations**, assuming they are linear.

Q.4 (4 points) Find the values of x and y so that:

$$\begin{bmatrix} x-2y & 0 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 0 \\ x+y & 4 \end{bmatrix}$$

Q.5 (10 points) Let $A = \begin{bmatrix} -2 & -1 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ -2 & 2 \end{bmatrix}$

Evaluate the matrix

a) $B^2 - 2A + 5I$

b) Solve the following equation for X .

$XA - 5B = 2I$

Q.6 (9 points) A company produces a product at a $\$6$ per unit and a fixed cost of $\$60,000$. If the selling price for each unit is $\$10$.

a) Find the number of units that must be sold for the company to break even.

b) Find the number of units that must be sold for the company to earn a profit of $\$24,000$.

c) If it was determined that the company will be able to sell $12,000$ units, what should the **selling price** be in order for the company to break even?

Q.7 (6 points) Suppose the quantities supplied and demanded of T-shirts at a concert are given by the equations:

$$S = -200 + 50p$$
$$D = 1000 - 25p$$

Where p is the price in \$ per T-shirt.

a) Find the **equilibrium price** (market price) and **the quantity** of T-shirts at this price.

b) What do you think will eventually (finally) happen in the market if the price is $\$20$ per T-shirt?

Q.8 (7 points) A pharmaceutical company makes two types of vitamins. **A high-potency vitamin** and **a calcium-enriched vitamin**. Each high-potency vitamin tablet contains $0.5g$ of vitamin C and $0.04g$ of calcium and generates a profit $\$0.1$ per tablet. A calcium-enriched vitamin tablet contains $0.1g$ of vitamin C and $0.4g$ of calcium and generates a profit of $\$0.05$ per tablet. The company has $300kg$ of vitamin C and $220kg$ of calcium available each day for manufacturing.

How many of each type of vitamin should be manufactured to maximize profit?

Write the corresponding linear programing problem for the above problem. **(Don't solve)**

Q.9 (11 points) Solve the linear programing problem:

Minimize $Z = 3x + 2y$

Subject to constraints

$$\begin{cases} x + 2y \geq 8 \\ 3x + y \geq 6 \\ x \leq 8 \\ x \geq 0 \ , \ y \geq 0 \end{cases}$$

Q.10 (12 points) Use matrices to solve the system

$$x + y + z = 3$$
$$2x + z = 0$$
$$3x - y - z = 1$$