Prince Sultan University

Department of Mathematical Sciences

Major I Exam

Semester I, 2014 B FALL (141)

October 22, 2014

MATH 101 – Finite Mathematics

Time Allowed : 90 minutes
Maximum Points: 80 points

Name of the student:_____

ID number :_____

Section : _____

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 9 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	15	
Q.2 , Q.3 , Q.4	19	
Q.5 , Q.6	19	
Q.7 , Q.8	17	
Q.9	10	
Total	**80**	

20

Q.1 B(15 points) ***Circle the correct answer.***

1) An equation for the line passing through $(5,-3)$ and having undefined slope is:

(a) $x-y=8$ (b) $y=-3$ (c) $x+y=-2$ (d) $x=5$

2) What is the value of (t) so that the following system has infinitely many solutions?

$$6x+2y=8$$
$$-12x+ty=-16$$

(a) $t=4$ (b) $t=6$ (c) $t=-4$ (d) $t=-6$

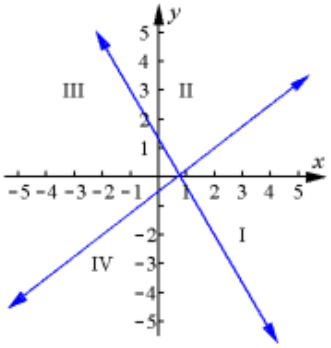
3) For the following augmented matrix, determine which of the following statements is **true** about the associated system of linear equations: $\left[\begin{array}{ccc|c} 1 & 3 & 0 & 7 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$

(a) The system has infinitely many solutions (b) The system has no solution

(c) The system has exactly two solutions (d) The system has exactly one solution

4) Determine which region I, II, III, or IV represents the graph of the given system of linear inequalities. The regions I, II, III, and IV are no overlapping regions bounded by the indicated lines.

$$\begin{cases} 3x-4y \le 2 \\ 5x+3y \le 4 \end{cases}$$



(a) I (b) III (c) II (d) IV

5) Which of the following matrices is in reduced row echelon form, RREF

(a) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 6 & -5 \\ 0 & 1 & 0 & 5 & -1 \\ 0 & 1 & 1 & -4 & -4 \end{array}\right]$ (b) $\left[\begin{array}{cccc|c} 1 & 5 & 0 & 6 & -5 \\ 0 & 1 & 1 & 5 & -1 \\ 0 & 0 & 1 & -4 & -4 \end{array}\right]$ (c) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 6 & -5 \\ 0 & 1 & 0 & 5 & -1 \\ 0 & 0 & 1 & -4 & -4 \end{array}\right]$ (d) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 6 & -5 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 5 & -4 \end{array}\right]$

6) Suppose that the cost of making 20 radios is $\$2000$ and the cost of making 40 radios is $\$3600$. Find the cost of making 10 radios

(a) $\$900$ (b) $\$1200$ (c) $\$1000$ (d) $\$800$

7) Let $A=\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$, then A^2 is:

(a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & 1 \\ 9 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 7 & 4 \\ 12 & 7 \end{bmatrix}$

8) The $y-\text{int}ercept$ of the line $2x-3y=-6$ is:

(a) $(2,0)$ (b) $(-3,0)$ (c) $(0,-6)$ (d) $(0,2)$

9) Find the equation of the horizontal line containing the point $(-5,-6)$.

(a) $x=-6$ (b) $x=-5$ (c) $y=6$ (d) $y=-6$

10) If B is a 2×3 matrix, and $B.A.B$ is defined. What is the dimension of matrix A ?

(a) 3×2 (b) 2×2 (c) 3×3 (d) 2×3

Q.2 (6 points) Consider the following two lines $L: 4x-2y=8$ and $M: -3x-2y=-13$.

a) Find the point of intersection of the lines L and M.

b) Find the equation of the line that is parallel to the line $2x+3y=8$ and passes through the point of intersection of the lines L and M obtained in part (a).

Q.3 (5 points) The supply (S) and demand (D) equations for salt have been estimated to be given by the equations: $S=97p+85$ and $D=-63p+165$, where p denotes the price.

a) Find the market price.

b) What quantity of supply is demanded at this market price?

Q.4 (8 points) Le Choc Confectionery Ltd. is a company that produces fine Belgian chocolates. The daily cost of producing each chocolate is $\$0.60$ and each one can be sold for $\$2.40$.
The daily operational overhead is $\$3600$.

a) Determine the revenue R, that the company makes from selling x chocolates per day.

b) Determine the cost C, to the company for producing x chocolates per day.

c) How many chocolates must be sold every day to break even?

d) How many chocolates must be sold every day for the company to make a $\$900$ profit?

Q.5 (12 points) Find the maximum and minimum values of the objective function $z = 10x + 12y$, subject to the following constraints:

$$\begin{cases} x + y \le 7 \\ 2x + 3y \le 18 \\ 2x + y \le 10 \\ x \ge 0 \\ y \ge 0 \end{cases}$$

Q.6 (7 points) Determine the solution of the following system using the **Addition/Elimination Method**.

$$\begin{aligned} y + 5z &= 17 \\ x + 2y - z &= 2 \\ 2x - y + 3z &= 9 \end{aligned}$$

Q.7 (9 points) Given the three matrices below, find x and y so that $4A.I_2 - C = B.C$

$$A = \begin{bmatrix} 2 & x \\ 0 & y \end{bmatrix} \quad , B = \begin{bmatrix} 3 & 1 \\ 4 & -2 \end{bmatrix} \quad , \quad \text{and} \quad C = \begin{bmatrix} 1 & -1 \\ 4 & 3 \end{bmatrix}$$

Q.8 (8 points) Consider the following system of linear equations.

$$x + 3y + 3z = 2$$
$$x + 4y + 3z = 4$$
$$x + 3y + 4z = 2$$

(i) Find the **inverse matrix** of the matrix of the coefficients.

(ii) Use the **inverse to solve** the system

Q.9 (10 points) Consider the following system of linear equations.

$$\begin{aligned} w + 2x + 3y + z &= 5 \\ w + x - y &= 3 \\ 3w + 5x + 2z &= -2 \end{aligned}$$

(i) Use the Reduced Row Echelon Form $(RREF)$ to solve the system

(ii) Is the system consistent or inconsistent? If yes, give the solution.