Prince Sultan University

Department of Mathematical Sciences

Major I Exam B

Semester I, 2010 Fall (101)

October 26, 2010

MATH 101 – Finite Mathematics

Time Allowed : 90 minutes
Maximum Points: 100 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 11 problems, some with several parts and a total of 7 pages. Make sure your paper has all these problems.

Question	Maximum score	Your Score
Q.1	20	
Q.2 , Q.3	14	
Q.4 , Q.5	18	
Q.6 , Q.7	18	
Q.8 , Q.9 , Q.10	20	
Q.11	10	
Total	**100**	

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Q.1 (20 points) ***Circle the correct answer.***

1) For the following augmented matrix, determine which of the following statements is true about the associated system of linear equations:

$$\left[\begin{array}{ccc|c} 1 & 0 & 3 & 6 \\ 0 & 1 & 0 & -4 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

(a) The system has no solution.
(b) The system has only one solution; $x=-9$, $y=-4$, $z=5$
(c) The solution is:. $x=6-3z$, $y=-4$, z: any real number
(d) More row operations is needed to put the matrix in $RREF$

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

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

3) Which of the following matrices is in reduced row echelon form?

(a) $\left[\begin{array}{ccc|c} 1 & 0 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & -1 & 4 \end{array}\right]$ (b) $\left[\begin{array}{ccc|c} 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 \end{array}\right]$

(c) $\left[\begin{array}{ccc|c} 1 & 0 & -1 & 3 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 \end{array}\right]$ (d) $\left[\begin{array}{ccc|c} 1 & 2 & -3 & 1 \\ 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 \end{array}\right]$

4) Which values of x and y make the following true?

$$\begin{bmatrix} x+y & 4 \\ 8 & 0 \end{bmatrix} = \begin{bmatrix} 8 & 4 \\ x-y & 0 \end{bmatrix}$$

(a) $x=8$, $y=0$ (b) $x=6$, $y=2$ (c) $x=10$, $y=2$ (d) $x=4$, $y=4$

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

$$\begin{aligned} 6x+2y &= 8 \\ -12x+ty &= -16 \end{aligned}$$

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

6) A general equation of the line having a slope = 4 and containing the point $(-3,4)$ is:

(a) $4x-y=-16$ (b) $4x+y=12$ (c) $4x+y=16$ (d) $4x-y=12$

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

(a) 2×3 (b) 3×3 (c) 2×2 (d) 3×2

8) find the product: $\begin{bmatrix} -2 & -2 \\ 2 & -4 \end{bmatrix}\begin{bmatrix} -5 & 2 & 1 \\ 5 & -8 & -6 \end{bmatrix}$

(a) $\begin{bmatrix} 0 & 12 \\ -30 & 36 \end{bmatrix}$ b) $\begin{bmatrix} -5 & 12 & 10 \\ -30 & -8 & -26 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 12 & 10 \\ -30 & 36 & 26 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 12 & 10 \\ -30 & -26 & -6 \end{bmatrix}$

9) What of the following could be the reduced row echelon form of the matrix $\left[\begin{array}{cc|c} 3 & 4 & 11 \\ 2 & 4 & 6 \\ 3 & 2 & -3 \end{array}\right]$

(a) $\left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{array}\right]$ (b) $\left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & -1 \\ 0 & 0 & -16 \end{array}\right]$ (c) $\left[\begin{array}{cc|c} 1 & 1 & 5 \\ 0 & 1 & -1 \\ 0 & 0 & -8 \end{array}\right]$ (d) $\left[\begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & -1 \\ 0 & 1 & -16 \end{array}\right]$

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

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

Q.2 (6 points) Find the value of m so that the line through $(2,-6)$ and $(m,3)$ is parallel to the line: $-3x+4y=10$

Q.3 (10 points) A publisher for a new novel figures fixed costs at $\$58,000$ and the cost for producing each book at $\$2.40$. If the book is sold to distributors for $\$13$ each:

(i) How many books must be produced for the publisher to break even?

(ii) If the publisher wants to make a profit of $\$10,000$, how many books should he sell?

Q.4 (6 points) The boiling point of water is linearly related to the altitude. Water boils at 100° when at sea level(zero altitude) and boils at 90° when at an altitude of $3{,}048\ \mathrm{m}$.

(i) Find an equation that describes the relationship between the temperature (T) and the altitude (L).
(ii) Find the boiling point at an altitude of $800\ \mathrm{m}$

Q.5 (9 points) At $\$0.48$ per bushel, the daily supply for wheat is 425 bushels and the Daily demand is 554 bushels. When the price is raised to $\$0.72$ per bushel, the daily supply increases to 505 bushels, and the daily demand decreases to 314 bushels. Assume that the supply and demand equations are linear.

(i) Find the supply equation.
(ii) Find the demand equation.
(iii) Find the market price.
(iv) How many bushels will be demanded at the market price?

Q.6 (8 points) Solve the following system of equations using the *elimination method*.

$$\begin{aligned} x - y + 3z &= 4 \\ x + 2y - 3z &= 0 \\ 2x + y &= 6 \end{aligned}$$

Q.7 (8 points) Use the matrices below to perform the indicated operation(s), if possible

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 0 & 4 & -2 \end{bmatrix}, \quad B = \begin{bmatrix} -3 & 1 \\ 2 & 5 \end{bmatrix}, \quad \text{and } C = \begin{bmatrix} 3 & -2 \\ 0 & -1 \\ 1 & 2 \end{bmatrix}$$

(i) $AC + 2I_2$

(ii) $BA - 5A$

Q.8 (8 points) Find $a,\ b,\ c,$ and d so that $\begin{bmatrix} 1 & -2 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix}=\begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$

Q.9 (10 points)

(i) Determine whether the given pair of lines are parallel, intersecting, or coincident? Give the reason.

$L\ : 9x+2y=-18$

$M : 7x-4y=36$

(i) The given pair of lines intersect. Find the point of intersection.

$L\ : 2x+7y=-4$

$M : 4x+9y=-18$

Q.10 (10 points) The following system of linear equations has infinitely many solutions. Give ***two possible*** solutions for the system.

$x_1+2x_2+4x_3=1$

$x_2-x_3+2x_4=2$

$x_3+3x_4=0$

Q.11 (10 points) Consider the following system of linear equations.

$$\begin{aligned} 3x + y &= 9 \\ x - y + z &= 4 \\ 3x + z &= 11 \\ 4x - y + 2z &= 15 \end{aligned}$$

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

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