Prince Sultan University

Department of Mathematical Sciences

Major I Exam A

Semester I, 2008 Fall (081)

11 November 2008

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 11 problems, some with several parts and a total of 8 pages. Make sure your paper has all these problems.**

Question	Maximum score	Your Score
Q.1	8	
Q.2	12	
Q.3	6	
Q.4	9	
Q.5	9	
Q.6	10	
Q.7	8	
Q.8	8	
Q.9	10	
Q.10	10	
Q.11	10	
Total	100	

Q.1 (8 points) *Write True(T) or False(F) for each of the following statements.*

1) $x=-3$, $y=2$ **is the solution for the following system of linear equations.** _____

$$3x-5y=-19$$
$$-4x+4y=20$$

2) Matrices of the same dimensions can always be multiplied. _____

3) All parallel lines must have the same slopes and the same $y-\text{int}ercepts$ _____

4) Every straight line has a slope. _____

5) The system $x+y+z=1$ **;** $x=y$ **;** $y=z$ **;** $y=1$ **is inconsistent.** _____

6) The inverse of $\begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix}$ **is** $\begin{bmatrix} -2 & -3 \\ 1 & 2 \end{bmatrix}$ _____

7) The following Reduced Row Echelon Form of the augmented matrix of a system of linear equations has no solution. _____

$$\left[\begin{array}{ccc|c} 1 & 2 & 0 & 3 \\ 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

8) A square matrix will always have an inverse. _____

Q.2 (12 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 general 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) $\left[\begin{array}{cccc|c} 1 & 3 & 0 & -3 & -8 \\ 0 & 1 & -6 & 3 & 3 \\ 0 & 0 & 1 & 8 & 2 \end{array}\right]$ **(b)** $\left[\begin{array}{cccc|c} 1 & 0 & 0 & -3 & -8 \\ 0 & 1 & 0 & 3 & 3 \\ 0 & 1 & 1 & 8 & 2 \end{array}\right]$

(c) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & -3 & -8 \\ 0 & 0 & 0 & 0 & 3 \\ 0 & 1 & 0 & 3 & 2 \end{array}\right]$ **(d)** $\left[\begin{array}{cccc|c} 1 & 0 & 0 & -3 & -8 \\ 0 & 1 & 0 & 3 & 3 \\ 0 & 0 & 1 & 8 & 2 \end{array}\right]$

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 (k) so that the following system has infinitely many solutions?

$$4x+2y=5$$
$$-12x+ky=-15$$

(a) $k=4$ **(b)** $k=-4$ **(c)** $k=-6$ **(d)** $k=6$

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 A **is a** 3×4 **matrix, and** $B.B.A$ **is defined. What is the dimension of matrix** B **?**

(a) 3×4 **(b)** 4×3 **(c)** 4×4 **(d)** 3×3

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)** $\begin{bmatrix} 0 & 12 & 10 \\ -30 & -26 & -6 \end{bmatrix}$

Q.3 (6 points) **Find an equation for the line with the given properties.**
Parallel to the line: $4x-9y=2$ **; containing the point** $(-4,-2)$
(Express the answer in general form)

Q.4 (9 points) **The supply and demand equations for a certain commodity have been given by the Equations, where** p **is the unit price in dollars and** S and D **are in thousands of units**

$S=15p+6$; $D=-15p+456$

(i) Find the market price.

(ii) What quantity of the commodity is demanded at this market price?

(iii) If the supplier decided to sell the commodity for $\$20$ **per unit, will there be a shortage (less) or surplus (more) of the commodity in the market?**

Q.5 (9 points) **A music Store finds that, when the store offers the CDs at** $\$10$ **per CD, it sells** $10,000$ **CD's per week. Dropping the price to** $\$7.5$ **per CD has the effect of increasing sales to** $17,500$ **CD's per week.**

(i) Use this data to set up a demand equation.

(ii) If this trend continues, how many CD's does the store expect to sell if it further drops the price to $\$6$ **per CD?**

Q.6 (10 points) **An Ice company sells bags of ice for $\$1.15$ per bag. The production cost per bag is $\$0.85$ and the weekly fixed costs are $\$7500$.**

(i) **Determine the revenue R from selling x bags of ice in a week.**

(ii) **Determine the cost C of producing x bags of ice per week.**

(iii) **Determine the profit P from selling x bags of ice per week.**

(iv) **Determine the break-even point.**

Q.7 (8 points) **Solve the following system of equations using the *elimination method*.**

$$x - y + 2z = 4$$
$$2x - y = 6$$
$$x + y - 3z = 0$$

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

$$A=\begin{bmatrix}2 & 1\\ -1 & 4\end{bmatrix}\ ,\quad B=\begin{bmatrix}5 & 2 & 3\\ 1 & 6 & -1\end{bmatrix}\ ,\ \textbf{and}\ C=\begin{bmatrix}3 & 1\\ 2 & -1\\ 4 & 1\end{bmatrix}$$

(i) $AI_2 + B.C$

(ii) $A.B + 2C$

Q.9 (10 points)

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

$$L: 2x - 4y = 2$$
$$M: x + 2y = -4$$

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

$$9x + 2y = 23$$
$$x - y = -6$$

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

$$x + 2y - z = 6$$
$$2x - y + 3z = -13$$
$$3x - 2y + 3z = -16$$

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

(ii) Give the solution of the system, if any.

(iii) Is the system consistent or inconsistent?

Q.11 (10 points) **(i) Find the inverse of:** $\begin{bmatrix} 1 & 2 & 1 \\ 1 & 1 & 2 \\ 2 & 0 & 2 \end{bmatrix}$

(ii) Use the inverse to solve the following system of linear equations.

$$x + 2y + z = 8$$
$$x + y + 2z = -2$$
$$2x + 2z = 4$$