Prince Sultan University

Department of Mathematical Sciences

Major I Exam

Semester II, 2011 A SPRING (102)

March 19, 2011

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 12 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 , Q.2	18	
Q.3 , Q.4	16	
Q.5 , Q.6 , Q.7	21	
Q.8 , Q.9	17	
Q.10 , Q.11	19	
Q.12	9	
Total	**100**	

Q.1 (6 points) ***Write True (T) or False (F) for each of the following statements.***

1) If a system of linear equations is inconsistent, then it has infinitely many solutions. _____

2) The system $\begin{aligned} x+y+z&=1 \\ x&=y \\ y&=1+z \end{aligned}$ has infinitely many solutions. _____

3) If $A.B$ and $B.A$ are both defined, then A and B may have different dimensions. _____

4) If $AX=B$ for any square matrix A, then $X=A^{-1}B$. _____

5) The inverse matrix of $A=\begin{bmatrix} 4 & -5 \\ -2 & 3 \end{bmatrix}$ is $A^{-1}=\begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$ _____

6) $x=3,\ y=-2$ is the solution of the following system of linear equations
$\begin{aligned} 3x+4y&=1 \\ x-2y&=7 \end{aligned}$ _____

Q.2 (12 points) ***Circle the correct answer.***

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

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

2) 15 pens and 7 pencils cost a total of $\$7.70$. 8 pens and 10 pencils cost a total of $\$9.15$. What linear system of equations represents this problem?

(a) $\begin{cases} 7x+15y=7.70 \\ 8x+10y=9.15 \end{cases}$ (b) $\begin{cases} 15x+7y=7.70 \\ 10x+8y=9.15 \end{cases}$ (c) $\begin{cases} 15x+7y=7.70 \\ 8x+10y=9.15 \end{cases}$ (d) $\begin{cases} 7x+15y=7.70 \\ 10x+8y=9.15 \end{cases}$

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

(a) $\left[\begin{array}{ccc|c} 1 & 0 & -7 & -9 \\ -7 & 1 & -9 & -8 \end{array}\right]$ (b) $\left[\begin{array}{ccc|c} 1 & 0 & -7 & -9 \\ 0 & 1 & -9 & -8 \end{array}\right]$ (c) $\left[\begin{array}{ccc|c} 1 & 1 & -7 & -9 \\ 0 & 1 & -9 & -8 \end{array}\right]$ (d) $\left[\begin{array}{ccc|c} 1 & -8 & -7 & -9 \\ 0 & 1 & -9 & -8 \end{array}\right]$

4) Find the market price for the given supply and demand equations. $S=32p+1000$ and $D=1900-28p$

(a) $p=15$ (b) $p=48$ (c) $p=17$ (d) $p=14$

5) Find the break-even point for the cost C of production and the revenue R if $C=11x+650$ and $R=16x$

(a) $x=2080$ (b) $x=120$ (c) $x=135$ (d) $x=130$

6) The equation of the line passing through the point $(-1,2)$ and parallel to the line $y=-3x+3$ is:

(a) $y=-3x+5$ (b) $y=-3x-1$ (c) $y=3x-1$ (d) $y=-3x-5$

7) 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) $\$1000$ (b) $\$900$ (c) $\$800$ (d) $\$1200$

8) If matrix A is a 3×3 matrix, matrix B is a 3×4 matrix, and matrix C is a 3×3 matrix, which one of the following matrix operation statements below *can* be performed?

(a) $(B+C).A$ (b) $(B\ .A)-C$ (c) $C\ .B^{-1}$ (d) $(A-C)\ .B$

Q.3 (10 points) A company produces a product for which the cost per unit is $\$4$ and the fixed cost is $\$40,000$. If the selling price for each unit is $\$8$.

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

(ii) Find the number of units that must be sold for the company to earn $50,000

(iii) If the company determined that they can only sell $8,000$ units. What should the selling price be in order to guarantee no loss?

Q.4 (6 points) Given the three matrices below, find x and y so that $3A-B=C$

$$A=\begin{bmatrix}2 & x\\ 4 & y\end{bmatrix}\ ,\quad B=\begin{bmatrix}1 & -1\\ 4 & 3\end{bmatrix}\ ,\quad \text{and } C=\begin{bmatrix}5 & -2\\ 8 & 9\end{bmatrix}$$

Q.5 (10 points)

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

$$L \ : 2x + 5y = -24$$
$$M : 4x + 10y = 14$$

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

$$L: \ 9x + 4y = 38$$
$$M: \ x - 5y = -23$$

Q.6 (7 points) Use the matrices below to perform the indicated operation(s), if possible

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

(i) $2A.I_2 + BC$

(ii) $C.A - 3B$

Q.7 (4 points) Use the following $(RREF)$ augmented matrix to give one possible solution of the system of linear equations it represents.

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -2 \\ 0 & 1 & 6 & -9 \end{array}\right]$$

Q.8 (8 points) A movie theater charges $7 for adults, $3 for children, and $2.50 for senior citizens. One day the theater sold 468 tickets and collected $1731 in receipts. There were 2 times as many children's tickets sold as adult tickets. How many adults, children, and senior citizens went to the movies that day?

Q.9 (9 points) The market price for a certain product is $15 per unit and occurs when 300 units are produced. At a price of $9, no units are produced, and, at a price of $20, no units are purchased.

(i) Find the supply equation

(ii) Find the demand equation

(iii) How many units will be purchased at a price of $12

Q.10 (9 points) Determine the solution of the following system using the Addition/Elimination Method.

$$-2x+3y+4z=50$$
$$-x+3y-z=1$$
$$5x-y+z=11$$

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

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

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

(ii) Use the inverse to solve the system

Q.12 (9 points) Consider the following system of linear equations.

$$x + 2y = 4$$
$$y + z = -1$$
$$3x + z = 4$$

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

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