Prince Sultan University
Orientation Mathematics Program

Math101

Major I

Fall Semester 091
Wednesday, November 04, 2009

Time Allowed: 90 minutes

Student Name: _____

Student ID #: _____ Section #: _____

Teacher'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. Provide an organized complete solution for each Question.
8. This examination has 12 problems. Make sure your paper has all these problems.

Problems	Max. points	Student's Points
1	18	
2,3,4	18	
5,6	16	
7	12	
8,9	16	
10,11,12	20	
Total	100	

Q.1 (18 points) Fill the following table with the corresponding correct answers.

A	B	C	D	E	F	G	H	I

A. The slope of the of the line $2x - y = 5$ **is**

a) 1/2 **b) 1** **c) 2** **d) 5**

B. The total cost of producing a certain commodity is $C = 0.2x + 230$ **SR. The cost of producing 5 units is:**

a) SR 231 **b) SR 50** **c) SR 10** **d) 240**

C. A *general equation* for the line having the given properties: Slope = 4; containing $(-3,4)$**.**

a) $4x - y + 16 = 0$ **b)** $y - 4 = 4(x + 3)$ **c)** $y = 4x + 16$ **d)** $4x - y = -16$

D. The following system $\begin{cases} 3x + y = -4 \\ x - 3y = 2 \end{cases}$ **has the solution**

a) $(1,1)$ **b) No solution** **c) Infinity many solutions** **d)** $(-1,-1)$

E. The augmented matrix that corresponds to the linear system $\begin{cases} 2x + 3y = 5 \\ x - 2y = 0 \end{cases}$ **is**

a) $\left[\begin{array}{cc|c} 2 & 3 & 5 \\ 1 & -2 & 0 \end{array}\right]$ **b)** $\left[\begin{array}{cc|c} 2 & -3 & 5 \\ 1 & -2 & 0 \end{array}\right]$ **c)** $\left[\begin{array}{cc|c} 2 & 1 & 5 \\ -3 & -2 & 0 \end{array}\right]$ **d)** $\left[\begin{array}{cc|c} 2 & -3 & 0 \\ 1 & -2 & 5 \end{array}\right]$

F. The augmented matrix that is in the reduced row echelon form is

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

G. If the matrix A is of size 3×5**, B is of size** 5×10**, and C is of size** 10×3**, then A(BC) is of size**

a) 3×5 **b)** 3×3 **c)** 3×10 **d)** 5×5

H. The inverse of the matrix $\begin{bmatrix} -1 & -1 \\ 2 & 2 \end{bmatrix}$ **is**

a) $\begin{bmatrix} 2 & 1 \\ -3 & -1 \end{bmatrix}$ **b)** $\begin{bmatrix} -2 & -1 \\ 3 & 1 \end{bmatrix}$ **c)** $\begin{bmatrix} 2 & 3 \\ -1 & -1 \end{bmatrix}$ **d) Does not exist**

I. Let $A = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$**. Then** A^2 **is**

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

Q.2 (6 points) **In 1998, the number of bachelor's degrees which were conferred by colleges and universities in the United States was 1,184,406. In 2003, the number of bachelor's degrees which were awarded was 1,348,503. Suppose we assume the relationship between time and degrees conferred is linear.**

(i) Write an equation that relates the number N of bachelor's degrees awarded in the year t.

(ii) If the trend continues, estimate the number of bachelor's degrees that were awarded in 2006.

Q.3 (6 points) **Find the equation of the line containing the point $(-2,-5)$ and parallel to the line containing the points $(-4,5)$ and $(2,-1)$.**

Q.4 (6 points) **Solve the system of equations** $\begin{cases} 3x+4y=4 \\ \frac{1}{2}x-3y=\frac{-1}{2} \end{cases}$ **using elimination method.**

Q.5 (10 points) **For $1.79 per copy, the Chicago Tribune will deliver the Sunday newspaper to your front door. The cost to the Tribune for Sunday home delivery is approximately $1.13 per newspaper with fixed costs of $1,252,000.**

(i) Determine the revenue R from delivering x newspapers.

(ii) Determine the cost C of delivering x newspapers.

(iii) Determine the profit P of delivering x newspapers.

(iv) Determine the break-even point.

Q.6 (6 points) **The reduced form for augmented matrices of some systems are given below. Determine whether the system is consistent or inconsistent. If it is consistent, give the solution.**

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

(ii) $\left[\begin{array}{ccc|c} 1 & 2 & -1 & 0 \\ 0 & 1 & -1 & 1 \\ 0 & 0 & 0 & 5 \end{array}\right]$

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

Q.7 (12 pointts) **Solve the system of equations** $\begin{cases} x+y+z+w=4 \\ 2x-y+z=0 \\ 3x+2y+z-w=6 \\ x-2y-2z+2w=-1 \end{cases}$ **using matrices.**

Q.8 (8 points) **Let** $A=\begin{bmatrix}2 & -1 & 3\\ 0 & 4 & -2\end{bmatrix}$, $B=\begin{bmatrix}-3 & 1\\ 2 & 5\end{bmatrix}$ **and** $C=\begin{bmatrix}3 & -2\\ 0 & -1\\ 1 & 2\end{bmatrix}$. **Find** $\left(B+I_2\right)^2-AC$.

Q.9 (8 points) **Given** $A=\begin{bmatrix}1 & 2 & 1\\ 1 & 1 & 2\\ 2 & 0 & 2\end{bmatrix}$. **Find the matrix** X **such that** $AX=3\begin{bmatrix}1 & 2\\ -2 & 3\\ 1 & 5\end{bmatrix}$.

Q.10(7 points) **Suppose that the quantity supplied S and quantity demanded D of T-shirts at a concert are given by the following**

$$S = -200 + 50p; \quad D = 1000 - 25p,$$

where p is the price.

(i) Find the equilibrium price for T-shirts at this concert.

(ii) What is the equilibrium quantity?

Q.11 (8 points) **Find the values of x such that** $\begin{bmatrix} x & 4 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 2 \\ 0 & 2 & 4 \end{bmatrix} \begin{bmatrix} x \\ -7 \\ \frac{5}{4} \end{bmatrix} = 0$

Q.12 (5 points) **Show that the matrices** $\begin{bmatrix} -1 & -2 \\ 3 & 4 \end{bmatrix}$ **and** $\begin{bmatrix} 2 & 1 \\ \frac{-3}{2} & \frac{-1}{2} \end{bmatrix}$ **are inverses of each other.**