# PRINCE SULTAN UNIVERSITY

## MATH 101 FINITE MATH

## MAJOR EXAM 1 19th OCOTOBER 2005

**Start : 9:00 pm**
**End: 10:30 pm**

**Name:** _____

**I.D.** _____

**Section: Circle One (8 a.m.– Sec. 11) (9 a.m. – Sec. 10)**

١. Answer all questions
٢. This exam consists of 1 Cover Sheet & 6 Question Sheets with 13 questions.
٣. You can use a calculator, **NOT** a mobile phone.
٤. No talking during the test.
٥. Show all working out in the space provided.

| Question No. | Max. Points | Points Scored |
|---|---|---|
| 1,2 | **16** | |
| 3,4 | **14** | |
| 5,6,7 | **18** | |
| 8,9 | **16** | |
| 10,11 | **14** | |
| 12,13 | **22** | |
| **TOTAL** | **100** | |

١) [6 points] Find the equation of the line **<u>in the form</u>** $Ax + By = C$ which contains the point $(-3,4)$ and has an $x$-intercept of 2.

٢) [10 points] Consider the two lines $\begin{aligned} L:&\ 3x - 2y = -5 \\ M:&\ 3x + y = -2 \end{aligned}$

a) Show that the two lines intersect.

b) Find the point of intersection.

٣) [6 points] Find the equation of the line, **<u>in the form</u>** $Ax+By=C$, which is perpendicular to the line $6x-2y=-5$; containing the point $(-1,-2)$.

٤) [8 points] For a charge of SR1.79 per copy the Arab News will deliver its newspaper to your door. The cost to the Arab News for delivery is SR0.53 per newspaper with fixed costs of SR 1,070,000.

a) Determine the revenue R the Arab News makes from delivering *x* newspapers.

b) Determine the cost C, to the Arab News of delivering *x* newspapers.

c) How many copies must the newspaper sell to **break even**?

٥) [8 points] The supply ($S$) and demand ($D$) equations for salt have been estimated to be given by the equations, where p is price:

$$S = 0.97p + 0.85 \qquad D = -0.53p + 1.65$$

a) Find the market price.

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

٦) [6 points] Solve the following system: $\begin{cases} 3x + y = 4 \\ x - 3y = -2 \end{cases}$

٧) [4 points] Find $x$ and $y$ so that

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

٨) [10 points] Solve the following system using **matrices**: $\begin{cases} 2x+y-z=2 \\ x+3y+2z=1 \\ x+y+z=2 \end{cases}$

٩) [6 points] The matrices A,B,C and D are defined as follows:

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

Find:

a) $AB$

b) $(D+I_3)C$

١٠) [6 points] Show (**with working out**) that the following matrices are inverses of each other:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} -\frac{5}{2} & 2 & -\frac{1}{2} \\ 1 & -1 & 1 \\ \frac{1}{2} & 0 & -\frac{1}{2} \end{bmatrix}$$

١١) [8 points] Find the inverse of $\begin{bmatrix} 1 & -1 & 1 \\ 0 & -2 & 1 \\ -2 & -3 & 0 \end{bmatrix}$

١٢) [10 points] Graph the following system of linear inequalities. Be sure to indicate clearly where your solution lies.

$$\begin{cases} x+y \geq 2 \\ 2x+3y \leq 12 \\ 3x+y \leq 12 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

١٣) [12 points] Find the maximum and minimum values of the objective function $z = 5x + 7y$, subject to the following constraints:

$$\begin{cases} x+y \geq 2 \\ x+y \leq 8 \\ 2x+y \leq 10 \\ x \geq 0 \\ y \geq 0 \end{cases}$$