PRINCE SULTAN UNIVERSITY

MATH 101 Major Exam I

Start: **4:00 PM**

End: **5:30 PM**

Name: _____

I.D. : _____

Section: _____

Dr. Nabil	Dr. Bahaaeldin	Mr. Khalid

1. Answer all questions.
2. This exam consists of 5 pages, 11 questions
3. You can use a calculator, NOT a mobile phone.
4. No talking during the test.
5. Show all working out in the space provided.

Question No.	Max. Points	Points Scored
1,2,3,4	**26**	
5,6,7	**21**	
8,9	**17**	
10,11	**16**	
TOTAL	**80**	

Q1. (6points) Write the equation of the line that is perpendicular to the line $2y - x = 6$ and passes through the point $(-1, 4)$

Q2. (8 points) Mike has just retired and needs $25,000 per year in supplementary income. He has $250,000 to invest and can invest in AA bonds at 12% annual interest or in Savings and Loan Certificates at 8% per year. How much money should be invested in each so that he realizes exactly $25,000 in extra income per year?

Q3. (6 points) Find t so that the line that passes through $(-1, 3 + t)$ and $(5,2)$ is parallel to the line $2x + 4y = 3$

Q4. (6 points) A garage door company's total monthly revenue from the sale of x garage doors is given by $R = 1225x$ and its total monthly costs are given by $C = 675x + 2200$. How many garage doors need to be sold each month to break even?

Q5. (5 points)The supply (S) and demand (D) equations for salt have been estimated to be given by the equations, where p is price: $S = 0.97p + 0.85$ and $D = -0.53p + 1.65$

Find the market price (equilibrium price.)

Q6. (8 points) Solve the system by using the **elimination method** $\begin{cases} x - y - z = 1 \\ -x + 2y - 3z = -4 \\ 3x - 2y - 7z = 0 \end{cases}$

Q7. (8 points) A restaurant manager wants to purchase 400 sets of dishes. One design costs $45 per set, while another costs $65 per set. If he only has $19400 to spend, how many of each design should he order?

Q8. (9points) Given $A = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$; $B = \begin{bmatrix} 2 & 3 & 4 \\ -2 & 5 & -1 \end{bmatrix}$; $C = \begin{bmatrix} 4 & 1 \\ 5 & -2 \\ 1 & 2 \end{bmatrix}$, *and*

$D = \begin{bmatrix} 2 & 0 & 5 \\ 0 & 2 & 3 \\ 0 & -2 & 2 \end{bmatrix}$, find the following

1) $BC - 3A$

2) $(D + I_3) \cdot C$

Q9. (8 points)

a) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 1 & -1 \\ 3 & -1 & 0 \\ 2 & -3 & 4 \end{bmatrix}$

b) Solve the following system by using the **inverse matrix** $\begin{cases} x + y - z = 3 \\ 3x - y = -4 \\ 2x - 3y + 4z = 6 \end{cases}$

Q10. (6 points) Graph the following system. Decide whether the graph is bounded or unbounded

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

Q11. (10 points) M & H has a sale on Doors and windows. Each door requires 2 hours to unpack and set up, and each window requires 1 hour. The storeroom space is limited to 50 items. The budget of the store allows only 80 hours of employee time for unpacking and set up. Doors sell for $250 each, and windows sell for $150 each. How many of each should the store order to maximize revenue?