Math 1101 **Sample Midterm Exam**

FOR FULL CREDIT, SHOW ALL OF YOUR WORK!! GOOD LUCK!!

1. **SET UP** a linear program for the following word problem. **DO NOT SOLVE.**

   Terrapin Airlines wants to fly up to 1400 members of a ski club to Colorado. The airline owns two types of planes. Type A can carry only 50 passengers, requires 3 flight attendants, and costs $14,000 for the trip. Type B can carry 300 passengers, requires 4 flight attendants, and costs $90,000 for the trip. If the airline must use at least as many type A planes as type B and has available only 42 flight attendants, how many planes of each type should be used to minimize the cost of the trip? (12 points)

2. Use the addition method to find the point of intersection of the lines $\begin{array}{rcl} 4x+7y & = & -5 \\ 5x-6y & = & -3 \end{array}$

   DO NOT express your answer in decimal form. Do not graph the lines. (8 points)

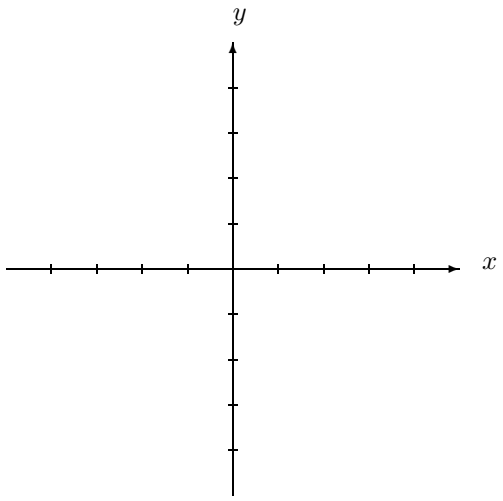
3. Given the system of equations $\begin{array}{rcl} 3x+4y & = & -2 \\ 5x-6y & = & 4 \end{array}$

   (a) Express the system in matrix form. (2 points)

   (b) Solve the system by using the inverse of the coefficient matrix. (8 points)

4. Solve the system of inequalities AND shade the region. (15 points)

$x \leq 2, \qquad x + 3y < 0, \qquad -3x + 4y \leq 12$



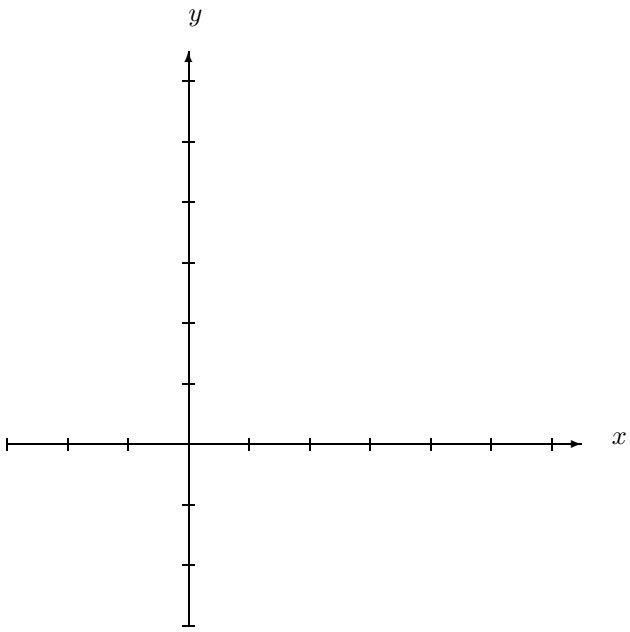
5. Find $2Y - 3X$ where $X = \begin{pmatrix} 12 & -13 & 17 \\ 14 & 8 & -14 \end{pmatrix}$ and $Y = \begin{pmatrix} 16 & 12 & -15 \\ -16 & 1 & -8 \end{pmatrix}$. (8 points)

6. Find the product: $\begin{pmatrix} 12 & 7 & -4 \\ 11 & -3 & -6 \end{pmatrix} \begin{pmatrix} -10 & 5 \\ 4 & -2 \\ 8 & 6 \end{pmatrix}$

Show the work, not just the calculator result. (12 points)

7. Solve the linear programming problem: Maximize and Minimize $P = -33x + 66y$ (25 points)

subject to: $-2x + 3y \leq 6$, $6x + 2y \geq 12$, $x \leq 4$, $y \geq 0$



SOLUTION: the maximum value is _____ and it occurs at the corner point (,);
the minimum value is _____ and it occurs at the corner point (,).

8. The message:

$$-44, 27, 55, -34, 31, -16, 61, -38, -111, 69$$

was encoded using the matrix $M = \begin{pmatrix} -3 & 2 \\ 5 & -3 \end{pmatrix}$ and the following coding scheme:

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	−1	2	−2	3	−3	4	−4	5	−5	6	−6	7	−7	8	−8	9	−9

S	T	U	V	W	X	Y	Z	blank	,	’	!	.	?
10	−10	11	−11	12	−12	13	−13	14	−14	15	−15	16	−16

(a) What matrix is needed to decode this message? (4 points)

(b) What is the message? (6 points)

The message is: _____