Math 3E (21961) HW #1

Due at the beginning of lecture on Thursday, February 5th.

In order to receive a ✓, you must attempt all problems and write out all steps leading to your answers neatly and legibly. You cannot simply write the correct answer to demonstrate your mathematical understanding.

You must include your name, the course title and section number on the first page. All homework sets must be stapled. No late homework will be accepted without my express permission. You may receive a ✗ if these guidelines are not followed.

Good luck!

Use the row reduction algorithm to transform the matrix into echelon form or reduced echelon form as indicated.

1) Find the reduced echelon form of the given matrix. 1) _____

$$\begin{bmatrix} 1 & 4 & -5 & 1 & 2 \\ 2 & 5 & -4 & -1 & 4 \\ -3 & -9 & 9 & 2 & 2 \end{bmatrix}$$

Determine whether the system is consistent by setting up the appropriate augmented matrix and using elementary row operations to find an echelon form of the matrix.

2) $x_1 - x_2 + 3x_3 = -9$ 2) _____
$-5x_1 + 5x_2 - 15x_3 = -2$
$x_1 + 5x_2 + x_3 = -17$

3) $x_1 + x_2 + x_3 = 6$ 3) _____
$x_1 - x_3 = -2$
$x_2 + 3x_3 = 11$

The augmented matrix is given for a system of equations. If the system is consistent, find the general solution. Otherwise state that there is no solution. Clearly state the basic variables and the free variables.

4) $\left[\begin{array}{ccc|c} 1 & 2 & -3 & -9 \\ 0 & 1 & 4 & 8 \\ 0 & 0 & 0 & 6 \end{array}\right]$ 4) _____

5) $\left[\begin{array}{ccc|c} 1 & 2 & -3 & 5 \\ 0 & 1 & 4 & -6 \\ 0 & 0 & 0 & 0 \end{array}\right]$ 5) _____

Solve the system of equations.

6) $4x_1 - x_2 + 3x_3 = 12$ 6) _____
$2x_1 + 9x_3 = -5$
$x_1 + 4x_2 + 6x_3 = -32$

7) $x_1 + x_2 + x_3 = 7$
$x_1 - x_2 + 2x_3 = 7$
$5x_1 + x_2 + x_3 = 11$ 7) _____

Find the indicated vector.

8) Let $\mathbf{u} = \begin{bmatrix} 5 \\ -6 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} -2 \\ -3 \end{bmatrix}$. Find $2\mathbf{u} + \mathbf{v}$. 8) _____

Answer Key
Testname: M3E_HW_1

1)
$$\begin{bmatrix} 1 & 0 & 3 & 0 & 14 \\ 0 & 1 & -2 & 0 & -4 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix}$$
2) No
3) Yes
4) No solution
5) $x_1 = 17 + 11x_3$
$x_2 = -6 - 4x_3$
x_3 is free
6) (2, –7, –1)
7) (1, 2, 4)
8)
$$\begin{bmatrix} 8 \\ -15 \end{bmatrix}$$