HW 1

Due Friday, September 8, 3pm

Section 1: 2, 10, 14, 16, 20, 22, 24

1.1.2

Solve the system by using elementary row operations on the equations or on the augmented matrix. Follow the systematic elimination procedure described in this section.

$2 x_1 + 4 x_2 = -4$
$5 x_1 + 7 x_2 = 11$

1.1.10

The augmented matrix of a linear system has been reduced by row operations to the form shown. Continue the appropriate row operations and describe the slution set of the original system.

$$\begin{bmatrix} 1 & -2 & 0 & 3 & -2 \\ 0 & 1 & 0 & -4 & 7 \\ 0 & 0 & 1 & 0 & 6 \\ 0 & 0 & 0 & 1 & -3 \end{bmatrix}$$

1.1.14

Solve the system of equations.

$$\begin{array}{rcrcrcr} x_1 & - & 3x_2 & & & = & 5 \\ -x_1 & + & x_2 & + & 5x_3 & = & 2 \\ & & x_2 & + & x_3 & = & 0 \end{array}$$

1.1.16

Determine if the system is consistent. Do not completely solve the system.

$$\begin{array}{rcrcrcrcr} x_1 & & & & & - & 2x_4 & = & -3 \\ & & 2x_2 & + & 2x_3 & & & = & 0 \\ & & & & x_3 & + & 3x_4 & = & 1 \\ -2x_1 & + & 3x_2 & + & 2x_3 & + & x_4 & = & 5 \end{array}$$

1.1.20

Determine the value(s) of h such that the matrix is the augmented matrix of a consistent linear system.

$$\begin{bmatrix} 1 & h & -3 \\ -2 & 4 & 6 \end{bmatrix}$$

1.1.22

Determine the value(s) of h such that the matrix is the augmented matrix of a consistent linear system.

$$\begin{bmatrix} 2 & -3 & h \\ -6 & 9 & 5 \end{bmatrix}$$

1.1.24

In this exercise, key statements from this section are either quoted directly, restated slightly (but still true), or altered in some way that makes them false in some cases. Mark each statement True or False, and justify your answer. (If true, give the approximate location where a similar statement appears, or refer to a definition or theorem. If false, give the location of a statement that has been quoted or used incorrectly, or cite an example that shows the statement is not true in all cases.)

a. Elementary row operations on an augmented matrix never change the solution set of the associated linear system.
b. Two matrices are row equivalent if they have the same number of rows.
c. An inconsistent system has more than one solution.
d. Two linear systems are equivalent if they have the same solution set.

Section 2: 6, 12, 16, 26, 29, 30, 31

1.2.6

Describe the possible echelon forms of a nonzero 3 x 2 matrix. Use the symbols ■, $*$, and 0, as in the first part of Example 1.

1.2.12

Find the general solution of the system whose augmented matrix is

$$\begin{bmatrix} 1 & -7 & 0 & 6 & 5 \\ 0 & 0 & 1 & -2 & -3 \\ -1 & 7 & -4 & 2 & 7 \end{bmatrix}$$

1.2.16

Use the notation of Example 1 for matrices in echelon form. Suppose each matrix represents the augmented matrix for a system of linear equations. In each case, determine if the system is consistent. If the system is consistent, determine if the solution is unique.

a. $\begin{bmatrix} \blacksquare & * & * \\ 0 & \blacksquare & * \\ 0 & 0 & 0 \end{bmatrix}$

b. $\begin{bmatrix} \blacksquare & * & * & * & * \\ 0 & 0 & \blacksquare & * & * \\ 0 & 0 & 0 & \blacksquare & * \end{bmatrix}$

1.2.26

Suppose the coefficient matrix of a linear system of three equations in three variables has a pivot in each column. Explain why the system has a unique solution. Restate the last sentence in Theorem 2 using the concept

1.2.29

A system of linear equations with fewer equations than unknowns is sometimes called an *underdetermined system*. Suppose that such a system happens to be consistent. Explain why there must be an infinite number of solutions.

1.2.30

Give an example of an inconsistent underdetermined system of two equations in three unknowns.

1.2.31

A system of linear equations with more equations than unknowns is sometimes called an *overdetermined system*. Can such a system be consistent? Illustrate your answer with a specific system of three equations in two unknowns.