Mathematics 210
Homework 1
Due Friday, September 12, 2 PM

Please note that this homework is due at 2 PM. No late homework can be accepted. You must turn in your answers by the start of class on Friday.

1. Use row reduction to find the solution set of this system of equations:

$$\begin{aligned} 6x + 7y + 4z &= 89 \\ x + 2y + 3z &= 40\,. \\ 2x + 3y + \ z &= 30 \end{aligned}$$

2. Use row reduction to find the solution set of this system of equations:

$$\begin{aligned} 9x_1 + 4x_2 + 5x_3 &= 115 \\ 3x_1 + 2x_2 - 4x_3 &= \ 98\,. \\ 5x_1 + 4x_2 + 5x_3 &= \ 67 \end{aligned}$$

3. Can you find values of a, b, and c that make this augmented matrix

$$\begin{bmatrix} 4 & 5 & a & 3 \\ 6 & 5 & b & 3 \\ 2 & 2 & c & 11 \end{bmatrix}$$

correspond to an *inconsistent* system of equations?

4. Consider this system of equations:

$$\begin{aligned} x_1 + 3x_2 &= c_1 \\ ax_1 + bx_2 &= c_2 \end{aligned},$$

where a, b, c_1, and c_2 are unknown fixed real numbers. If you are told that this is a consistent set of equations for all values of c_1 and c_2, what (if anything) can you say about the values of the unknowns a and b?

5. Consider these two augmented matrices:

$$\begin{bmatrix} 3 & 4 & 11 \\ 4 & 3 & 12 \end{bmatrix} \qquad \begin{bmatrix} 5 & 6 & 13 \\ 6 & 5 & 13 \end{bmatrix}$$

Do they correspond to equivalent systems of equations?

6. Find the solution set of the system corresponding to this augmented matrix:

$$\begin{bmatrix} 3 & 4 & 5 & 11 \\ 2 & 3 & 4 & 12 \end{bmatrix}$$

7. Find the solution set of the system corresponding to this augmented matrix:

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

8. Find a system of equations that is equivalent to this vector equation:

$$x_1 \begin{bmatrix} 6 \\ -1 \\ 5 \end{bmatrix} + x_2 \begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix} = \begin{bmatrix} 11 \\ 12 \\ -3 \end{bmatrix}.$$

You do not need to find the solution set of the system.

9. Find a vector equation which is equivalent to this system:

$$\begin{aligned} 3x_2 - 4x_3 &= 11 \\ 2x_1 + 4x_2 + 9x_3 &= 13 \end{aligned}.$$

10. Let

$$A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ -2 & 6 & 3 \end{bmatrix} \text{ and } \mathbf{b} = \begin{bmatrix} 10 \\ 3 \\ 3 \end{bmatrix}.$$

Is $\mathbf{b}$ a linear combination of the vectors formed by the columns of A?