Math 369 HW #1

Due 8:00 AM Friday, Jan. 27

1. Consider the system of equations

$$\begin{aligned} 3x - 6y &= 0 \\ x - 4y &= 8 \end{aligned}$$

   (a) Find all solutions of this system of equations.

   (b) In a single plot, draw the lines described by the two equations above as well as the lines determined by any other equations that come up in the course of finding solutions, and note any solutions you found in the previous part.

2. (1.1.16(a)) Find *all* solutions of the system of equations

$$\begin{aligned} 6x_1 + 2x_2 &= -8 \\ 3x_1 + x_2 &= -4 \end{aligned}$$

3. (1.1.26) Suppose you want to find a, b, and c so that the parabola $y = ax^2 + bx + c$ is guaranteed to pass through the points $(1, 1)$, $(2, 4)$, $(-1, 1)$. Find (but don't worry about solving) a system of linear equations whose solution(s) will give values for a, b, and c. How many solutions should this system have? Why?

4. Consider the following system:

$$\begin{array}{rcrcrcrcr} -a & & - & & 2c & - & d & = & 4 \\ -4a & - & b & - & 4c & - & d & = & 18 \\ 3a & + & b & + & 3c & + & d & = & -13 \end{array}$$

   (a) Use equation operations to find any solutions of this system.

   (b) Write down the augmented matrix that corresponds to this system of linear equations.

   (c) Transform the matrix into reduced row echelon form.

   (d) Use part (c) to find any solutions of the system. (*Hint:* If you get different answers here than in part (a), you did something wrong.)

5. The following augmented matrices correspond to different systems of equations. For each matrix, decide whether the corresponding system has no solutions, one solution, or infinitely many solutions.

   (a) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$

   (b) $\left[\begin{array}{cccc|c} 1 & 2 & 3 & 4 & 5 \\ 0 & 0 & 6 & 7 & 8 \\ 0 & 0 & 0 & 9 & 10 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$

(c) $\left[\begin{array}{cccc|c} -1 & 1 & -1 & 1 & -1 \\ 0 & 1 & -1 & 1 & -1 \\ 0 & 0 & 1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{array}\right]$