Name:________________________

M331: Linear Algebra Activity (1)

1. Find *all* of the solutions (i.e. x-values) to the following equations:

   (a) $17 + 4x = 2$

   (b) $x^2 = 4$

   (c) $\sin(x) = \pi$

   (d) $32x - 3 = 7x + 3$

   (e) $x^2 = -1$

   (f) $x^2 - 5x + 6 = 0$

   Would you call any of the equations "linear"? If so, which ones? Why?

2. What rules did you implicitly use to find the solutions to problem 1d)?

3. If possible, solve the following systems of equations using any techniques you may remember.

   (a) $$\begin{aligned} 4x + 2y &= 10 \\ 3x - y &= 2 \end{aligned}$$

   (b) $$\begin{aligned} 3x + 5y &= 10 \\ 9x + 15y &= 30 \end{aligned}$$

   (c) $$\begin{aligned} 7x - 2y &= 8 \\ 4x + 2y &= 3 \\ -x + y &= 4 \end{aligned}$$

4. Explain the interesting features of the previous problem.

5. Do you think you *could* solve the following system of equations?

$$\begin{aligned} 4a + 3b + 2c + d - 5e &= 2000 \\ 2a + 7b + 3c + 11d - e &= 100 \\ 3a - 5b - 6c + 2d + e &= 557 \\ -a - 3b - 13c + 22d + 7e &= 2400 \\ 8a - 6b + 3c + 2d - 7e &= 2 \end{aligned}$$

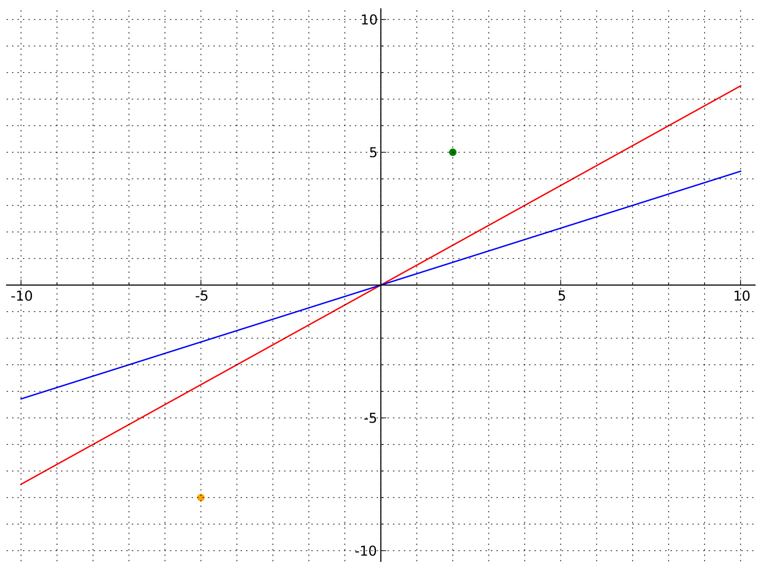
   Explain a few of your reasons for coming to your conclusion.

6. Suppose that a and b are two fixed real numbers. Find the solution(s) to the system:

$$ax = b$$

7. In the following picture, we have the following information:

   - The red line is given by $y = \frac{3}{4}x$; hence it connects $(0, 0)$ to $(4, 3)$ (why?).
   - The blue line is given by $y = \frac{3}{7}x$; hence it connects $(0, 0)$ to $(7, 3)$ (why?).
   - The green dot is at $(2, 5)$.
   - The orange dot is at $(-5, -8)$.



Suppose you are standing at the origin, $(0, 0)$. You may only walk *parallel* to the red line or *parallel* to the blue line.

   (a) Can you get to the green dot? If yes, explain how. If not, explain why not.

   (b) Can you get to the orange dot? If yes, explain how. If not, explain why not.

   (c) Describe the set of points you can get to under these rules.

   (d) To Think About: For the set of points given in part (c), give a general method for explaining how to get to a given point in that set.

8. To Think About: Can you construct a system of two equations with two variables (similar to those in problem 3) that has exactly two solutions? Explain.