MAT 121 Writing Project #4 – Fall, 2021 Name_____
70 Points

This Project is due Monday, November 29th, after we get back from Thanksgiving.

Early Birds: Monday, November 22nd, the Monday before Thanksgiving. 20% Bonus!!!

Options for Turn-In:

1. Submit a quality scan to a single, multi-page PDF. Submit your work in PDF by e-mail *in the Course Shell* to hmills1@online.aims.edu.

2. Snail-mail it to me at my *home address*:

   Harry Mills
   2358 50th Avenue
   Greeley, CO 80634

   Or

3. Slide it under the door at my office on campus, EDBH 134K.

If you can get the hard copy to me, without scanning, you can save some hassle getting the scan to come through clearly enough to be processed.

1 Solve the system of linear equations $\begin{matrix} 5x+8y=40 \\ x-2y=4 \end{matrix}$ in 3 ways:

a. (10 pts) Find the general vicinity of the solution by graphing the system. This should give you a general idea. Don't worry about it being super-accurate, although the more care you take, the better the estimate will be. Just graph the two lines by the intercept method. Supply the exact answer after you work parts b and c, below. I care much more about ordered-pair labels (OPLs) than tickmarks. OPLs are required. *x*- and *y*-intercepts are required. Tickmarks are not. On a test, I'm always looking for the labels. The tickmarks are just busy work that slows you down, when you're on the clock, and slow *me* down counting tickmarks!

b. (10 pts) Use the Substitution Method

c. (10 pts) Use the Elimination Method.

2. (10 pts) Use Elimination to solve the independent system of linear equations: $\begin{matrix} 5x+11y+z=73 \\ 4x+9y\quad\ =51 \\ 2x+4y+\ z=33 \end{matrix}$. Hint:

-1 Equation 2 + Equation 1 will put a nice '1' in the top-left corner, which makes the arithmetic a lot easier!

3. Consider the dependent system of linear equations:
$$\begin{aligned} x + 2y + 3z &= 5 \\ 4x + 11y + 14z &= 16 \\ 2x + 7y + 8z &= 6 \end{aligned}$$

   a. (10 pts) Use Elimination to obtain the general solution. Be kind to your teacher and let z be free! That means, find an expression for x and y in terms of the variable z.

   b. (10 pts) Give the particular solutions corresponding to $z = 0$, $z = 1$ and $z = -1$.

4. **The Underlying Assumption:** *All* of the techniques we learn for solving systems of linear equations are based on the *assumption* that the systems *have* solutions. So when we arrive at a false (*absurd!*) statement after a few elimination steps, the only explanation is that there was no solution in the first place*. Our incorrect assumption* led to something absurd, like 0 = 10 or $0 = -5$.

   *... or you made a mechanical error and should check your work, just to make sure. Stay organized and always check your work.

   Higher Learning: In higher mathematics, this is the most basic method of proving something is false: "Assume it's true and conclude something absurd (like '0 = 1')." It's important that you realize what's happening when you arrive at those absurdities at the end of a perfectly logical and legal sequence of moves. That said, let me *finally* get to the question:

   (10 pts) **Your Task:** Show that the dependent system of linear equations
$$\begin{aligned} x + 2y + 3z &= 5 \\ 4x + 11y + 14z &= 16 \\ 2x + 7y + 8z &= 11 \end{aligned}$$
   has no solution. I expect to see the word "absurd" in your discussion.