MAT 121 Writing Project #4 – Spring, 2022 Name_____
70 Points Systems of Linear Equations

FORMATTING: This is semi-formal writing, here. That means show some professionalism. You don't have to type it out, but you do need to be very clear. See Course Schedule for due dates. **Staple this page, with your name on it, as a cover sheet for your project. Do not staple your project to your test. This project is due Wednesday, April 20th.**

1. Write on only one side of each page. I will not award (or deduct) points for anything on the backs of pages.
2. Plain white paper without lines (8 ½ x 11-inch A4 copier paper works just fine). Paper with lines:
3. Staple top left corner. Do NOT staple over problem numbers or any of your work. If I can't see it, you didn't do it.
4. Leave margins. "MAT 121" in big letters in top left corner of every page solves all problems with margins. We
5. Write DARK. I don't mind if you use pen. Just put a line through mistakes. Pencil's good, but make sure you're getting it DARK, i.e., BLACK, with a white background.
6. Leave ROOM between problems and between steps on your work. I have bad eyes, so being stingy with space and paper is a mistake on Writing Projects. **Don't do work in 2 columns!**

For early feedback, make a black-and-white, multi-page PDF and upload it to the D2L drop-box for Writing Project #4. Otherwise, mail your neat, clear, black-and-white, one-side-of-each-page work to me at:

Harry Mills
EDBH 134K
Aims Community College
5401 West 20th Street
Greeley, CO 80634

Alternatively, you may just slide it under my office door in Ed Beaty by or before the deadline: EDBH 134K

Mail or E-Mail your Writing Project 2 by or before Friday, April 20th. Late work accepted as late as Tuesday, April 26th, at a 20% discount.

Main Resources: Chapter 4 Videos (and notes), Writing Project 2 Videos (and notes), and a selection of Old Writing Projects.

1 Solve the system of linear equations $\begin{aligned} x-3y&=-9 \\ 4x-11y&=-32 \end{aligned}$ in 3 ways:

a. (10 pts) Find the general vicinity of the solution by graphing the system. This should at least give you a general idea. Don't worry about it being super-accurate. Just graph the two lines by the intercept method. Supply the exact answer after you work parts b and c, below. Resist the temptation to use tickmarks on the horizontal and vertical axes.

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: $\begin{aligned} x+2y&=-1 \\ 3x+7y-z&=-6 \\ -2x-6y+3z&=9 \end{aligned}$.

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

   a. (10 pts) Give 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
$$\begin{aligned} x + 3y - 2z &= 3 \\ 3x + 7y - 7z &= 11 \\ 2x + 4y - 5z &= 9 \end{aligned}$$
   has no solution. I expect to see the word "absurd" in your discussion.