Mathematics 1275CO/OL27 **Quiz #2**
Instructor: Suman Ganguli **Due: Thursday, Sept 30** **Name:** ______________________

Solve the following system of 3 linear equations in 3 variables:

$$\begin{aligned} -2x + 5y + z &= 8 & (1) \\ x - 2y - 3z &= -13 & (2) \\ x + 3y - z &= 5 & (3) \end{aligned}$$

1. Choose a pair of equations, and eliminate one of the variables by using the addition method.
   (Hint: You can eliminate z by adding equations (1) and (3)!)

Solution: Add equations (1) and (3) in order to eliminate z:

$$\begin{aligned} -2x + 5y + z = \quad & 8 \\ x + 3y - z = \quad & 5 \\ \hline -x + 8y = \quad & 13 \end{aligned}$$

Note: it's also possible to start with a different pair of equations and/or eliminate a variable other z, but the algebra is more complicated.

2. Choose a *different* pair of equations, and eliminate the *same* variable:

Solution: Add 3 times equation (1) to equation (2) in order to eliminate z:

$$\begin{aligned} -6x + 15y + 3z = \quad & 24 \\ x - 2y - 3z = \quad & -13 \\ \hline -5x + 13y = \quad & 11 \end{aligned}$$

Note: it's also possible to use equations (2) and (3).

3. Solve the resulting system of 2 equations in 2 variables:

Solution: Multiply through the equation from step 1 by -5 and add to equation from step 2:

$$\begin{aligned} 5x - 40y = \quad & -65 \\ -5x + 13y = \quad & 11 \\ \hline -27y = \quad & -54 \end{aligned}$$

So $y = 2$. Plug this into either equation above to solve for x, e.g., substituting $y = 2$ into the 2nd equation:

$$-5x + 13(2) = 11 \Longrightarrow -5x = -15 \Longrightarrow x = 3$$

4. Plug the values of the 2 variables you solved for above into any of the 3 original equations, and solve for the 3rd variable:

Solution: Substituting $x = 3$ and $y = 2$ into equation (1):

$$-2(3) + 5(2) + z = 8 \Longrightarrow -6 + 10 + z = 8 \Longrightarrow z = 4$$

5. Check the solution by substituting your values for (x, y, z) into each of the original equations:

Solution: Substitute $x = 3$, $y = 2$, and $z = 4$ into each of equations (1), (2), and (3) and verify that the RHS equals the LHS.