

Warm up

Solve the following system of equations using algebra and tell what type of system it is.

$$6x + 6y - 12z = 12$$

$$3x - y + z = 1$$

$$2x + 2y - 4z = 4$$

Using 1 + 3

$$6x + 6y - 12z = 12$$

$$(-) \underline{6x + 6y - 12z = 12}$$

$$0 = 0$$

Infinite.
Solutions

Consistent system with a dependent solution

Questions from Homework

$$\begin{aligned} \textcircled{2} \quad & 4x + 3y - z = -7 \\ & 3x - 2y + 3z = -10 \\ & x + y - z = -2 \end{aligned}$$

$$\left[\begin{array}{ccc|c} 4 & 3 & -1 & -7 \\ 3 & -2 & 3 & -10 \\ 1 & 1 & -1 & -2 \end{array} \right] \xrightarrow{\substack{R_2 - 3R_3 \\ R_1 - R_3}} \left[\begin{array}{ccc|c} 4 & 3 & -1 & -7 \\ 0 & -5 & 6 & -4 \\ 0 & 1 & -3 & -1 \end{array} \right] \xrightarrow{\substack{5R_2 + R_3 \\ R_1 + R_3}} \left[\begin{array}{ccc|c} 4 & 3 & -1 & -7 \\ 0 & -5 & 6 & -4 \\ 0 & 0 & -9 & -9 \end{array} \right]$$

$$\begin{aligned} -9z &= -9 & -5y + 6z &= 4 & 4x + 3y - z &= -7 & (-3, 2, 1) \\ \boxed{z = 1} & & -5y + 6(1) &= 4 & 4x + 3(2) - (1) &= -7 & \\ & & -5y &= -10 & 4x + 6 - 1 &= -7 & \\ & & \boxed{y = 2} & & 4x - 1 &= -7 & \\ & & & & \boxed{x = -3} & & \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad & 3x + 5y - z = 47 \\ & 2x - y + 3z = -2 \\ & 4x + y - 2z = 30 \end{aligned}$$

$$\left[\begin{array}{ccc|c} 3 & 5 & -1 & 47 \\ 2 & -1 & 3 & -2 \\ 4 & 1 & -2 & 30 \end{array} \right] \xrightarrow{\substack{3R_2 - 2R_1 \\ R_3 - 2R_1}} \left[\begin{array}{ccc|c} 3 & 5 & -1 & 47 \\ 0 & -13 & 11 & -100 \\ 0 & 3 & -8 & 34 \end{array} \right] \xrightarrow{13R_3 + 3R_2} \left[\begin{array}{ccc|c} 3 & 5 & -1 & 47 \\ 0 & -13 & 11 & -100 \\ 0 & 0 & -71 & 142 \end{array} \right]$$

$$\begin{aligned} -71z &= 142 & -13y + 11z &= -100 & 3x + 5y - z &= 47 \\ \boxed{z = -2} & & -13y + 11(-2) &= -100 & 3x + 5(6) - (-2) &= 47 \\ & & -13y - 22 &= -100 & 3x + 30 + 2 &= 47 \\ & & -13y &= -78 & 3x &= 15 \\ & & \boxed{y = 6} & & \boxed{x = 5} & \end{aligned}$$

Solve the following system of equations using an augmented matrix reduced to its row echelon form...

$$2x + 2y + 4z = 0$$

$$x - 2y + z = 3$$

$$2x + 5y + 8z = 6$$

1. Express system in the form of an augmented matrix
2. Eliminate "x" in equation 2 and 3.
3. Eliminate "y" in equation 3 (must add/subtract 2 and 3)
4. Create triangle of zeroes and solve.

$$\left[\begin{array}{ccc|c} 2 & 2 & 4 & 0 \\ 1 & -2 & 1 & 3 \\ 2 & 5 & 8 & 6 \end{array} \right] \xrightarrow{\substack{2R_2 - R_1 \\ R_3 - R_1}} \left[\begin{array}{ccc|c} 2 & 2 & 4 & 0 \\ 0 & -9 & -6 & 0 \\ 0 & 3 & 4 & 6 \end{array} \right] \xrightarrow{3R_3 + R_2} \left[\begin{array}{ccc|c} 2 & 2 & 4 & 0 \\ 0 & -9 & -6 & 0 \\ 0 & 0 & 6 & 18 \end{array} \right]$$

$$6z = 18$$

$$\boxed{z = 3}$$

$$-9y - 6z = 0$$

$$-9y - 6(3) = 0$$

$$-9y - 18 = 0$$

$$-9y = 18$$

$$\boxed{y = -2}$$

$$2x + 2y + 4z = 0$$

$$2x + 2(-2) + 4(3) = 0$$

$$2x - 4 + 12 = 0$$

$$2x + 8 = 0$$

$$2x = -8$$

$$\boxed{x = -4}$$

$$\underline{\underline{(-4, -2, 3)}}$$

Check with TI-84

$$2x + 2y + 4z = 0$$

$$x - 2y + z = 3$$

$$2x + 5y + 8z = 6$$

$$\left[\begin{array}{ccc|c} 2 & 2 & 4 & 0 \\ 1 & -2 & 1 & 3 \\ 2 & 5 & 8 & 6 \end{array} \right]$$

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rref([A])
[[1 0 0 -4]
 [0 1 0 -2]
 [0 0 1 3]]
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$(-4, -2, 3)$

Homework

Worksheet #

Solve the system of equations using matrix elimination!