Answer on Question #59826 – Math – Linear Algebra

Question

(Q3) Use Gaussian reduction to solve the following system of equations and verify your results by using Mat Lab

X + Y + Z = 1
X + 2Y + 3Z = 2
2X + Y + 4Z = 5

Solution

$$\begin{bmatrix} x & +y & +z & = & 1 \\ x & +2y & +3z & = & 2 \\ 2x & +y & +4z & = & 5 \end{bmatrix} \underline{R_2 \to R_2 - R_1} \begin{bmatrix} x & +y & +z & = & 1 \\ & y & +2z & = & 1 \\ 2x & +y & +4z & = & 5 \end{bmatrix} \underline{R_3 \to R_3 - 2R_1}$$

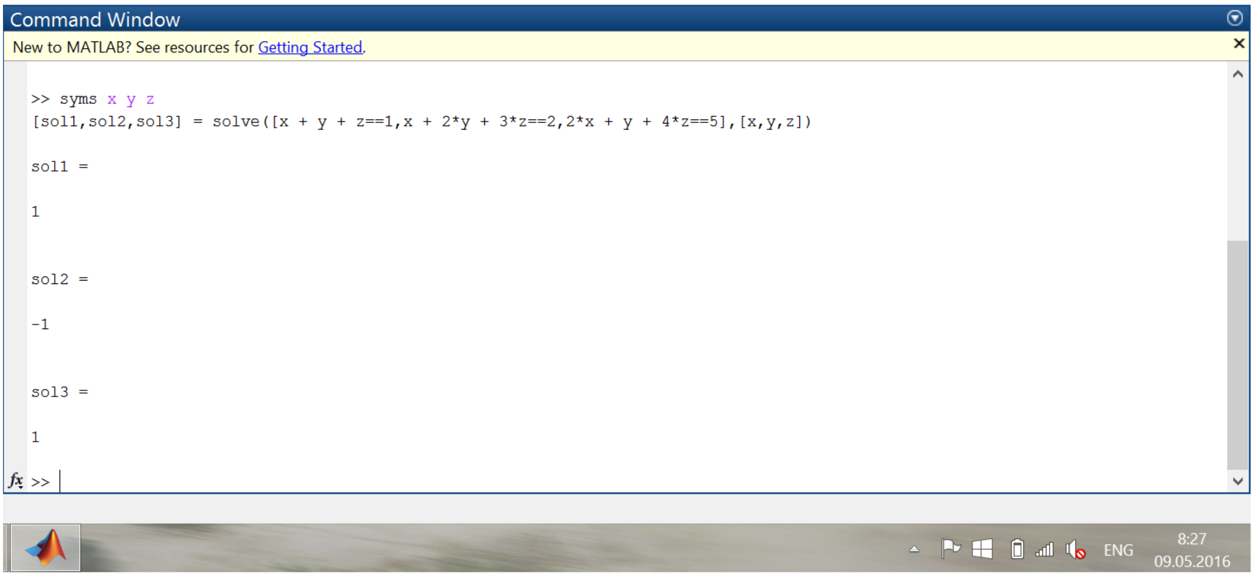
$$\begin{bmatrix} x & +y & +z & = & 1 \\ & y & +2z & = & 1 \\ & -y & +2z & = & 3 \end{bmatrix} \underline{R_3 \to R_3 + R_2} \begin{bmatrix} x & +y & +z & = & 1 \\ & y & +2z & = & 1 \\ & & +4z & = & 4 \end{bmatrix} \underline{R_3 \to R_3/4}$$

$$\begin{bmatrix} x & +y & +z & = & 1 \\ & y & +2z & = & 1 \\ & & z & = & 1 \end{bmatrix} \underline{R_2 \to R_2 - 2R_3}$$

$$\begin{bmatrix} x & +y & +z & = & 1 \\ & y & & = & -1 \\ & & z & = & 1 \end{bmatrix} \underline{R_1 \to R_1 - R_2} \begin{bmatrix} x & & +z & = & 2 \\ & y & & = & -1 \\ & & z & = & 1 \end{bmatrix} \underline{R_1 \to R_1 - R_2} \begin{bmatrix} x & & & = & 1 \\ & y & & = & -1 \\ & & z & = & 1 \end{bmatrix}$$

where R_1, R_2, R_3 are row 1, row 2, row 3 respectively, $R_2 \to R_2 - R_1$ means that the first row is subtracted from the second row and the result is placed in the second row.

Verify the result using Mat Lab:



Answer: $(X, Y, Z) = (1, -1, 1)$.