

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

$$\begin{aligned}X + Y + Z &= 1 \\X + 2Y + 3Z &= 2 \\2X + Y + 4Z &= 5\end{aligned}$$

Solution

$$\left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ x & +2y & +3z & = 2 \\ 2x & +y & +4z & = 5 \end{array} \right] \xrightarrow{R_2 \rightarrow R_2 - R_1} \left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ & y & +2z & = 1 \\ 2x & +y & +4z & = 5 \end{array} \right] \xrightarrow{R_3 \rightarrow R_3 - 2R_1}$$

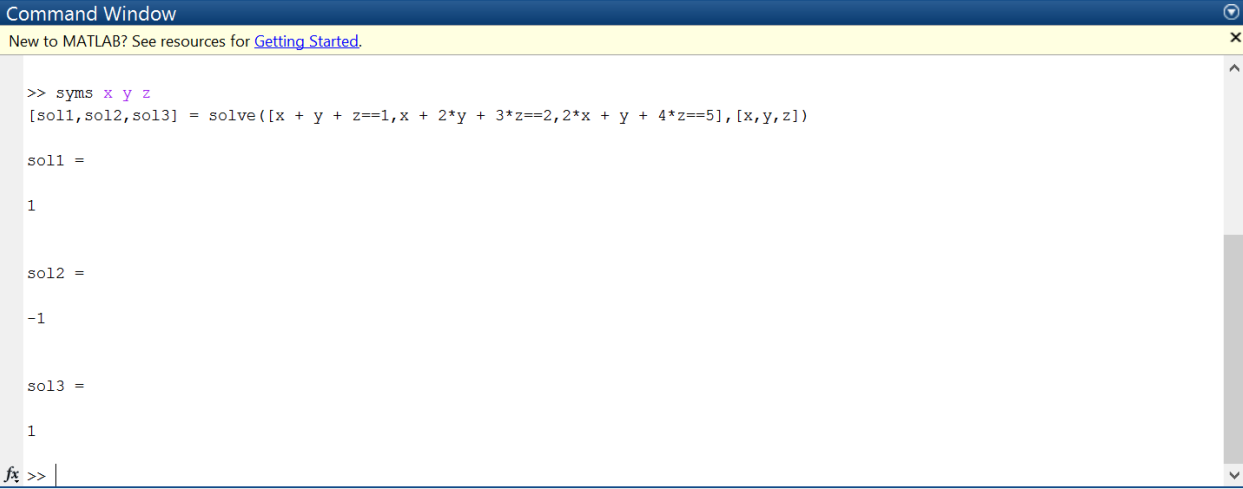
$$\left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ & y & +2z & = 1 \\ & -y & +2z & = 3 \end{array} \right] \xrightarrow{R_3 \rightarrow R_3 + R_2} \left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ & y & +2z & = 1 \\ & & +4z & = 4 \end{array} \right] \xrightarrow{R_3 \rightarrow R_3/4}$$

$$\left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ & y & +2z & = 1 \\ & & z & = 1 \end{array} \right] \xrightarrow{R_2 \rightarrow R_2 - 2R_3}$$

$$\left[\begin{array}{ccc|c} x & +y & +z & = 1 \\ & y & & = -1 \\ & & z & = 1 \end{array} \right] \xrightarrow{R_1 \rightarrow R_1 - R_2} \left[\begin{array}{ccc|c} x & & +z & = 2 \\ & y & & = -1 \\ & & z & = 1 \end{array} \right] \xrightarrow{R_1 \rightarrow R_1 - R_2} \left[\begin{array}{ccc|c} x & & & = 1 \\ & y & & = -1 \\ & & z & = 1 \end{array} \right]$$

where R_1, R_2, R_3 are row 1, row 2, row 3 respectively, $R_2 \rightarrow R_2 - R_1$ 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:



```
Command Window
New to MATLAB? See resources for Getting Started.

>> syms x y z
[so11,so12,so13] = solve([x + y + z==1,x + 2*y + 3*z==2,2*x + y + 4*z==5],[x,y,z])

so11 =
1

so12 =
-1

so13 =
1

fx >>
```

The screenshot shows the MATLAB Command Window with the following text: "Command Window", "New to MATLAB? See resources for Getting Started.", ">> syms x y z", "[so11,so12,so13] = solve([x + y + z==1,x + 2*y + 3*z==2,2*x + y + 4*z==5],[x,y,z])", "so11 =", "1", "so12 =", "-1", "so13 =", "1", "fx >>". The window title bar shows "Command Window" and "New to MATLAB? See resources for Getting Started.". The system tray at the bottom shows the time "8:27" and date "09.05.2016".

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