

Name Solution

Mathematics 2602

Quiz 9

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Consider the linear system  $Ax = b$  where  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 16 \\ 3 & 9 & 40 \end{bmatrix}$  and  $b = \begin{bmatrix} 14 \\ 60 \\ 141 \end{bmatrix}$ .

Put the augmented matrix  $(A | b)$  in row echelon form.

$$[A | b] = \left[ \begin{array}{ccc|c} 1 & 2 & 3 & 14 \\ 2 & 5 & 16 & 60 \\ 3 & 9 & 40 & 141 \end{array} \right] \xrightarrow{\substack{r_2 \leftarrow (-2)r_1 + r_2 \\ r_3 \leftarrow (-3)r_1 + r_3}} \left[ \begin{array}{ccc|c} 1 & 2 & 3 & 14 \\ 0 & 1 & 10 & 32 \\ 0 & 3 & 31 & 99 \end{array} \right]$$

$$\xrightarrow{r_3 \leftarrow (-3)r_2 + r_3} \left[ \begin{array}{ccc|c} 1 & 2 & 3 & 14 \\ 0 & 1 & 10 & 32 \\ 0 & 0 & 1 & 3 \end{array} \right].$$

Find the reduced row echelon form for  $(A | b)$ .

$$\left[ \begin{array}{ccc|c} 1 & 2 & 3 & 14 \\ 0 & 1 & 10 & 32 \\ 0 & 0 & 1 & 3 \end{array} \right] \xrightarrow{\substack{r_1 \leftarrow (-3)r_3 + r_1 \\ r_2 \leftarrow (-10)r_3 + r_2}} \left[ \begin{array}{ccc|c} 1 & 2 & 0 & 5 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

$$\xrightarrow{r_1 \leftarrow (-2)r_2 + r_1} \left[ \begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array} \right].$$

Solve the system  $Ax = b$  for  $x$ .

The system  $Ax = b$  is equivalent to

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} x = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \text{ so } x = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}.$$