MTH 329 Quiz 5

Sunday, February 25, 2024 8:13 AM

Find inverse of $\begin{bmatrix} -1 & 4 & 5 \\ 3 & 6 & -2 \\ 4 & 3 & 1 \end{bmatrix}$

Soln:

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

$r_2^* = r_2 + 3r_1$, $r_3^* = r_3 + 4r_1$

$$\left[\begin{array}{ccc|ccc} -1 & 4 & 5 & 1 & 0 & 0 \\ 0 & 18 & 13 & 3 & 1 & 0 \\ 0 & 19 & 21 & 4 & 0 & 1 \end{array}\right]$$

$r_3^* = r_3 - \frac{19}{18} r_2$

$$\left[\begin{array}{ccc|ccc} -1 & 4 & 5 & 1 & 0 & 0 \\ 0 & 18 & 13 & 3 & 1 & 0 \\ 0 & 0 & 131/18 & 5/6 & -\frac{19}{18} & 1 \end{array}\right]$$

$r_1^* = -r_1$, $r_2^* = \frac{1}{18} r_2$, $r_3^* = \frac{18}{131} r_3$

$$\left[\begin{array}{ccc|ccc} 1 & -4 & -5 & -1 & 0 & 0 \\ 0 & 1 & 13/18 & 3/18 & 1/18 & 0 \\ 0 & 0 & 1 & \frac{15}{131} & \frac{-19}{131} & \frac{18}{131} \end{array}\right]$$

$r_1^* = r_1 + 5r_3$, $r_2^* = r_2 - \frac{13}{18} r_3$

$$\left[\begin{array}{ccc|ccc} 1 & -4 & 0 & \frac{-56}{131} & \frac{-95}{131} & \frac{90}{131} \\ 0 & 1 & 0 & \frac{11}{131} & \frac{21}{131} & \frac{-13}{131} \\ 0 & 0 & 1 & \frac{15}{131} & \frac{-19}{131} & \frac{18}{131} \end{array}\right]$$

$r_1^* = r_1 + 4r_2$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 1 & \frac{-12}{131} & \frac{-11}{121} & \frac{38}{131} \\ 0 & 1 & 0 & 11/131 & 21/131 & -13/131 \\ 0 & 0 & 1 & 15/131 & -19/131 & 18/131 \end{array}\right]$$

Therefore,

$$\begin{bmatrix} -1 & 4 & 5 \\ 3 & 6 & -2 \\ 4 & 3 & 1 \end{bmatrix}^{-1} = \frac{1}{131} \begin{bmatrix} -12 & -11 & 38 \\ 11 & 21 & -13 \\ 15 & -19 & 18 \end{bmatrix}$$