

$$1. A = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 3 & 1 \\ 3 & -2 & 3 \end{bmatrix} \xrightarrow{R_1 \times \frac{1}{2}} \begin{bmatrix} 1 & -\frac{1}{2} & 1 \\ 1 & 3 & 1 \\ 3 & -2 & 3 \end{bmatrix} \xrightarrow{R_2 - R_1} \begin{bmatrix} 1 & -\frac{1}{2} & 1 \\ 0 & \frac{7}{2} & 0 \\ 3 & -2 & 3 \end{bmatrix} \xrightarrow{R_3 - 3R_1} \begin{bmatrix} 1 & -\frac{1}{2} & 1 \\ 0 & \frac{7}{2} & 0 \\ 0 & -\frac{1}{2} & 0 \end{bmatrix} \xrightarrow{R_2 \times \frac{2}{7}} \begin{bmatrix} 1 & -\frac{1}{2} & 1 \\ 0 & 1 & 0 \\ 0 & -\frac{1}{2} & 0 \end{bmatrix} \xrightarrow{R_1 \times 2} \begin{bmatrix} 2 & -1 & 2 \\ 0 & 1 & 0 \\ 0 & -\frac{1}{2} & 0 \end{bmatrix}$$

$\det(A) = 2 \times 1 \times 0 = 0$

The inverse of the matrix can't be solved because the determinant is 0.

2. Because the inverse of the matrix of A can't be calculated, then the question can't be continued.

$$3. \left[\begin{array}{cccc|cccc} 1 & 3 & 1 & -1 & 1 & 0 & 0 & 0 \\ 1 & -1 & -2 & 2 & 0 & 1 & 0 & 0 \\ 3 & -1 & 2 & 1 & 0 & 0 & 1 & 0 \\ 3 & 2 & -3 & 2 & 0 & 0 & 0 & 1 \end{array} \right] \xrightarrow{\substack{R_2 - R_1 \\ R_3 - 3R_1 \\ R_4 - 3R_1}} \left[\begin{array}{cccc|cccc} 1 & 3 & 1 & -1 & 1 & 0 & 0 & 0 \\ 0 & -4 & -3 & 3 & -1 & 1 & 0 & 0 \\ 0 & -10 & -1 & 4 & -3 & 0 & 1 & 0 \\ 0 & -7 & -6 & 5 & -3 & 0 & 0 & 1 \end{array} \right] \xrightarrow{R_2 / -4} \left[\begin{array}{cccc|cccc} 1 & 3 & 1 & -1 & 1 & 0 & 0 & 0 \\ 0 & 1 & \frac{3}{4} & -\frac{3}{4} & \frac{1}{4} & -\frac{1}{4} & 0 & 0 \\ 0 & -10 & -1 & 4 & -3 & 0 & 1 & 0 \\ 0 & -7 & -6 & 5 & -3 & 0 & 0 & 1 \end{array} \right] \xrightarrow{\substack{R_1 - 3R_2 \\ R_3 + 10R_2 \\ R_4 + 7R_2}} \left[\begin{array}{cccc|cccc} 1 & 0 & -\frac{5}{4} & \frac{5}{4} & \frac{1}{4} & \frac{3}{4} & 0 & 0 \\ 0 & 1 & \frac{3}{4} & -\frac{3}{4} & \frac{1}{4} & -\frac{1}{4} & 0 & 0 \\ 0 & 0 & \frac{1}{2} & -\frac{7}{2} & -\frac{1}{2} & -\frac{3}{2} & 1 & 0 \\ 0 & 0 & -\frac{3}{4} & -\frac{1}{4} & -\frac{3}{4} & -\frac{7}{4} & 0 & 1 \end{array} \right] \xrightarrow{R_3 \times \frac{2}{13}} \left[\begin{array}{cccc|cccc} 1 & 0 & -\frac{5}{4} & \frac{5}{4} & \frac{1}{4} & \frac{3}{4} & 0 & 0 \\ 0 & 1 & \frac{3}{4} & -\frac{3}{4} & \frac{1}{4} & -\frac{1}{4} & 0 & 0 \\ 0 & 0 & 1 & -\frac{7}{13} & -\frac{1}{13} & -\frac{5}{13} & \frac{2}{13} & 0 \\ 0 & 0 & -\frac{3}{4} & -\frac{1}{4} & -\frac{3}{4} & -\frac{7}{4} & 0 & 1 \end{array} \right] \xrightarrow{\substack{R_1 + \frac{5}{4}R_3 \\ R_2 - \frac{3}{4}R_3 \\ R_4 + \frac{3}{4}R_3}} \left[\begin{array}{cccc|cccc} 1 & 0 & 0 & \frac{15}{26} & \frac{2}{13} & \frac{7}{26} & \frac{5}{26} & 0 \\ 0 & 1 & 0 & -\frac{9}{26} & \frac{4}{13} & \frac{1}{26} & -\frac{3}{26} & 0 \\ 0 & 0 & 1 & -\frac{7}{83} & -\frac{1}{13} & -\frac{5}{13} & \frac{2}{13} & 0 \\ 0 & 0 & 0 & -\frac{17}{26} & -\frac{17}{13} & -\frac{53}{26} & \frac{3}{26} & 1 \end{array} \right] \xrightarrow{\substack{R_1 - \frac{15}{24}R_4 \\ R_2 + \frac{9}{26}R_4 \\ R_3 + \frac{17}{13}R_4}} \left[\begin{array}{cccc|cccc} 1 & 0 & 0 & 0 & -1 & -\frac{26}{17} & \frac{5}{17} & \frac{15}{17} \\ 0 & 1 & 0 & 0 & 1 & \frac{19}{17} & -\frac{3}{17} & -\frac{9}{17} \\ 0 & 0 & 1 & 0 & 1 & \frac{22}{17} & \frac{1}{17} & -\frac{14}{17} \\ 0 & 0 & 0 & 1 & 2 & \frac{53}{17} & -\frac{3}{17} & -\frac{26}{17} \end{array} \right] \xrightarrow{R_1 \times \frac{-26}{17}} \left[\begin{array}{cccc|cccc} 1 & 0 & 0 & 0 & -1 & -\frac{26}{17} & \frac{5}{17} & \frac{15}{17} \\ 0 & 1 & 0 & 0 & 1 & \frac{19}{17} & -\frac{3}{17} & -\frac{9}{17} \\ 0 & 0 & 1 & 0 & 1 & \frac{22}{17} & \frac{1}{17} & -\frac{14}{17} \\ 0 & 0 & 0 & 1 & 2 & \frac{53}{17} & -\frac{3}{17} & -\frac{26}{17} \end{array} \right]$$

$$A^{-1} = \begin{bmatrix} -1 & -\frac{26}{17} & \frac{5}{17} & \frac{15}{17} \\ 1 & \frac{19}{17} & -\frac{3}{17} & -\frac{9}{17} \\ 1 & \frac{22}{17} & \frac{1}{17} & -\frac{14}{17} \\ 2 & \frac{53}{17} & -\frac{3}{17} & -\frac{26}{17} \end{bmatrix} = \frac{1}{17} \begin{bmatrix} -17 & -26 & 5 & 15 \\ 17 & 19 & -3 & -9 \\ 17 & 22 & 1 & -14 \\ 34 & 53 & -3 & -26 \end{bmatrix}$$

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