

MATH 54 SUMMER 2017, QUIZ 8

Is A invertible? If so, find the inverse. If not, explain why not.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 5 \\ 0 & 6 & 7 \end{bmatrix}$$

$$\left[\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 2 & 5 & 0 & 1 & 0 \\ 0 & 6 & 7 & 0 & 0 & 1 \end{array} \right] \xrightarrow{R_3 = R_3 - 3R_2} \left[\begin{array}{ccc|ccc} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 2 & 5 & 0 & 1 & 0 \\ 0 & 0 & -8 & 0 & -3 & 1 \end{array} \right]$$

$$\xrightarrow{R_1 = R_1 - R_2} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & -1 & 0 \\ 0 & 2 & 5 & 0 & 1 & 0 \\ 0 & 0 & -8 & 0 & -3 & 1 \end{array} \right]$$

$$\xrightarrow{R_3 = -\frac{1}{8}R_3} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & -1 & 0 \\ 0 & 2 & 5 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 3/8 & -1/8 \end{array} \right]$$

$$\xrightarrow{R_2 = R_2 - 5R_3} \left[\begin{array}{ccc|ccc} 1 & 0 & -2 & 1 & -1 & 0 \\ 0 & 2 & 0 & 0 & -7/8 & 5/8 \\ 0 & 0 & 1 & 0 & 3/8 & -1/8 \end{array} \right]$$

$$\xrightarrow{R_1 = R_1 + 2R_3} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1/4 & -1/4 \\ 0 & 2 & 0 & 0 & -7/8 & 5/8 \\ 0 & 0 & 1 & 0 & 3/8 & -1/8 \end{array} \right]$$

$$\xrightarrow{R_2 = \frac{1}{2}R_2} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & -1/4 & -1/4 \\ 0 & 1 & 0 & 0 & -7/16 & 5/16 \\ 0 & 0 & 1 & 0 & 3/8 & -1/8 \end{array} \right]$$

A is invertible. Its inverse is $\begin{bmatrix} 1 & -1/4 & -1/4 \\ 0 & -7/16 & 5/16 \\ 0 & 3/8 & -1/8 \end{bmatrix}$

Date: June 26, 2017.

Check:

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 5 \\ 0 & 6 & 7 \end{bmatrix} \begin{bmatrix} 1 & -1/4 & -1/4 \\ 0 & -7/16 & 5/16 \\ 0 & 3/8 & -1/8 \end{bmatrix} = \begin{bmatrix} 1 & -1/4 & -7/8 + 9/8 & -1/4 + 5/8 - 3/8 \\ 0 & -7/8 + 15/8 & 5/8 - 5/8 \\ 0 & -21/8 + 21/8 & 15/8 - 7/8 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$