Quiz #3

MATH 237 — Linear Algebra I
Thursday, Sept 22

Please print your name:

Problem 1. Consider the matrix $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 0 & 1 & -3 \end{bmatrix}$

(a) Calculate A^{-1}.

(b) Calculate $\det(A)$.

Solution. $\left[\begin{array}{ccc|ccc} 1 & 0 & 1 & 1 & 0 & 0 \\ 2 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & -3 & 0 & 0 & 1 \end{array}\right] \overset{R_2-2R_1\Rightarrow R_2}{\rightsquigarrow} \left[\begin{array}{ccc|ccc} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & -2 & -2 & 1 & 0 \\ 0 & 1 & -3 & 0 & 0 & 1 \end{array}\right] \overset{R_3-R_2\Rightarrow R_3}{\rightsquigarrow} \left[\begin{array}{ccc|ccc} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & -2 & -2 & 1 & 0 \\ 0 & 0 & -1 & 2 & -1 & 1 \end{array}\right]$

$\overset{-1R_3\Rightarrow R_3}{\rightsquigarrow} \left[\begin{array}{ccc|ccc} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & -2 & -2 & 1 & 0 \\ 0 & 0 & 1 & -2 & 1 & -1 \end{array}\right] \overset{\substack{R_1-R_3\Rightarrow R_1 \\ R_2+2R_3\Rightarrow R_2}}{\rightsquigarrow} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 3 & -1 & 1 \\ 0 & 1 & 0 & -6 & 3 & -2 \\ 0 & 0 & 1 & -2 & 1 & -1 \end{array}\right]$

(a) $A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -6 & 3 & -2 \\ -2 & 1 & -1 \end{bmatrix}$

(b) $\det(A) = \det\left(\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -2 \\ 0 & 0 & -1 \end{bmatrix}\right) = -1$

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