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Quiz 2

This quiz is graded out of 6 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. §1.2 #43a Prove that if $ad - bc \neq 0$, then the reduced row echelon form of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

Premise: $ad-bc \neq 0$

conclusion: RREF of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

assume $a \neq 0$. $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \sim aR_2 \to R_2 \begin{bmatrix} a & b \\ ac & ad \end{bmatrix}$ since $a \neq 0$

$\sim -cR_1 + R_2 \to R_2 \begin{bmatrix} a & b \\ 0 & ad-bc \end{bmatrix}$

$\sim \frac{1}{ad-bc} R_2 \to R_2 \begin{bmatrix} a & b \\ 0 & 1 \end{bmatrix}$ since $ad-bc \neq 0$

$\sim -bR_2 + R_1 \to R_1 \begin{bmatrix} a & 0 \\ 0 & 1 \end{bmatrix} \sim \frac{1}{a} R_1 \to R_1 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ since $a \neq 0$

assume $a = 0$. Then $ad - bc \neq 0$ implies that $b \neq 0$ and $c \neq 0$.

$\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 0 & b \\ c & d \end{bmatrix} \sim R_1 \leftrightarrow R_2 \begin{bmatrix} c & d \\ 0 & b \end{bmatrix} \sim \frac{1}{b} R_2 \to R_2 \begin{bmatrix} c & d \\ 0 & 1 \end{bmatrix}$ since $b \neq 0$

$\sim -dR_2 + R_1 \to R_1 \begin{bmatrix} c & 0 \\ 0 & 1 \end{bmatrix}$

$\sim \frac{1}{c} R_1 \to R_1 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ since $c \neq 0$.