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Math 2250, Fall 2008, Quiz 4
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Find the inverses of the following matrices if they have an inverse, and tell how you know they do not have an inverse if they do not.

1. (1 pt)

$$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad \text{Row exchange } R_i \leftrightarrow R_j \text{ is its own inverse.}$$

2. (1 pt)

$$\begin{bmatrix} 4 & 0 \\ 0 & \frac{1}{9} \end{bmatrix} \quad \begin{bmatrix} \frac{1}{4} & 0 \\ 0 & 9 \end{bmatrix} \quad \text{Inverse of } R_i \rightarrow sR_i \text{ is } R_i \rightarrow \frac{1}{s}R_i$$

3. (2 pts)

$$\begin{bmatrix} 0 & 4 \\ \frac{1}{9} & 0 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & \frac{1}{9} \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad \text{so } \begin{bmatrix} 0 & 4 \\ \frac{1}{9} & 0 \end{bmatrix}^{-1} = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} \frac{1}{4} & 0 \\ 0 & 9 \end{bmatrix} = \begin{bmatrix} 0 & 9 \\ \frac{1}{4} & 0 \end{bmatrix}$$

4. (2 pts)

$$\begin{bmatrix} 0 & 3 & 6 \\ 2 & 0 & 4 \\ 2 & 3 & 10 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \xrightarrow{-R_1, -R_2} \begin{bmatrix} 0 & 3 & 6 & | & 1 & 0 & 0 \\ 2 & 0 & 4 & | & 0 & 1 & 0 \\ 0 & 0 & 0 & | & 0 & 0 & 1 \end{bmatrix} \quad \text{No inverse because it is not row equivalent to } I$$

5. (4 pts)

$$\begin{bmatrix} 0 & 3 & 6 \\ 2 & 0 & 4 \\ 2 & 3 & 11 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \xrightarrow{\begin{matrix} * \frac{1}{2} \\ * \frac{1}{3} \\ -R_1, -R_2 \end{matrix}} \begin{bmatrix} 1 & 0 & 2 & | & 0 & \frac{1}{2} & 0 \\ 0 & 1 & 2 & | & \frac{1}{3} & 0 & 0 \\ 0 & 0 & 1 & | & -1 & -1 & 1 \end{bmatrix} \xrightarrow{\begin{matrix} -2R_3 \\ -2R_3 \end{matrix}} \begin{bmatrix} 1 & 0 & 0 & | & 2 & \frac{5}{2} & -2 \\ 0 & 1 & 0 & | & \frac{7}{3} & 2 & -2 \\ 0 & 0 & 1 & | & -1 & -1 & 1 \end{bmatrix}$$

$$\text{So } \begin{bmatrix} 0 & 3 & 6 \\ 2 & 0 & 4 \\ 2 & 3 & 11 \end{bmatrix}^{-1} = \begin{bmatrix} 2 & \frac{5}{2} & -2 \\ \frac{7}{3} & 2 & -2 \\ -1 & -1 & 1 \end{bmatrix}$$