

Name: _____ ID: _____

Answer each question completely. You must justify your answers to get credit. Even a correct answer with no justification will get no credits. Each problem is worth 5 points.

Consider the matrices $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ 1 & 1 \end{bmatrix}$.

1. Compute AB and BA .

Solution.

$$AB = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} -1 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix}$$
$$BA = \begin{bmatrix} -1 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$$

□

2. Compute A^{-1} using Gauss–Jordan elimination.

Solution. We have

$$\begin{bmatrix} 1 & 2 & | & 1 & 0 \\ 1 & 1 & | & 0 & 1 \end{bmatrix} \xrightarrow[\leftarrow_+]{\rightarrow_+^{-1}} \begin{bmatrix} 1 & 2 & | & 1 & 0 \\ 0 & -1 & | & -1 & 1 \end{bmatrix} \xrightarrow[\rightarrow_2]{\leftarrow_+} \begin{bmatrix} 1 & 0 & | & -1 & 2 \\ 0 & -1 & | & -1 & 1 \end{bmatrix} \xrightarrow{| \cdot (-1)} \begin{bmatrix} 1 & 0 & | & -1 & 2 \\ 0 & 1 & | & 1 & -1 \end{bmatrix}$$

Therefore we read off $A^{-1} = \begin{bmatrix} -1 & 2 \\ 1 & -1 \end{bmatrix}$.

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