

Matrix Algebra

Elementary Matrices

Homework 5

For each of the following matrices A , find a matrix E such that EA is in row-echelon form. What is EA ?

1.

$$A = \begin{pmatrix} 2 & 1 & 5 \\ 1 & 1 & 5 \\ 0 & 2 & 7 \end{pmatrix}$$

Answer: One possibility is:

$$E = \begin{pmatrix} 1/2 & 0 & 0 \\ -1 & 2 & 0 \\ -2/3 & 4/3 & -1/3 \end{pmatrix}$$

$$EA = \begin{pmatrix} 1 & 1/2 & 5/2 \\ 0 & 1 & 5 \\ 0 & 0 & 1 \end{pmatrix}$$

2.

$$A = \begin{pmatrix} 2 & 0 & 4 & 6 \\ 1 & 2 & 10 & 21 \\ 1 & 1 & 6 & 13 \end{pmatrix}$$

Answer: One possibility is:

$$E = \begin{pmatrix} 1/2 & 0 & 0 \\ -1/4 & 1/2 & 0 \\ -1/4 & -1/2 & 1 \end{pmatrix}$$

$$EA = \begin{pmatrix} 1 & 0 & 2 & 3 \\ 0 & 1 & 4 & 9 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

3.

$$A = \begin{pmatrix} 1 & 0 & 2 & 3 \\ 1 & 2 & 7 & 9 \\ 0 & 2 & 7 & 10 \\ 1 & 1 & 5 & 7 \end{pmatrix}$$

Answer: One possibility is:

$$E = \begin{pmatrix} 1 & 0 & 0 & 0 \\ -1/2 & 1/2 & 0 & 0 \\ 1/2 & -1/2 & 1/2 & 0 \\ -3/4 & -1/4 & -1/4 & 1 \end{pmatrix}$$

$$EA = \begin{pmatrix} 1 & 0 & 2 & 3 \\ 0 & 1 & 5/2 & 3 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$