LARSON—MATH 310—CLASSROOM WORKSHEET 07
Elimination Matrices

Review

- Find a matrix E which adds -1· row 1 to row 3 $(-1\rho_1 + \rho_3)$. Check.

- Find a matrix E which adds -2· row 2 to row 3 $(-2\rho_2 + \rho_3)$. Check.

- Find a matrix E which adds -2· row 1 to row 2 $(-2\rho_1 + \rho_2)$. Check.

Elimination matrices

We talked about row operations for solving a system of linear equations: (1) add a multiple of one equation to another, (2) multiple any equation by a non-zero scalar, and (3) switch the order of any pair of equations. None of these operations changes the solutions of the system.

1. Find a matrix E which multiplies row 3 by 5 $(5\rho_3)$. Check by finding $E\vec{u}$. $\vec{u} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$.

2. Find a matrix E which switches rows 1 and 2 $(\rho_1 \leftrightarrow \rho_2)$. Check by finding $E\vec{u}$.

3. Let $E = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ What is the effect of (left) multiplication by E on a vector?

4. Let $E = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ What is the effect of (left) multiplication by E on a vector?

5. Let $E = \begin{bmatrix} 1 & 5 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ What is the effect of (left) multiplication by E on a vector?

6. Let $E = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 4 & 0 & 1 \end{bmatrix}$ What is the effect of (left) multiplication by E on a vector?

7. Let $E = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ What is the effect of (left) multiplication by E on a vector?

Matrix Multiplication.

8. Find:
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -5 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 3 & -1 & 1 \\ 5 & -1 & 5 \end{bmatrix}$$

9. Find:
$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -5 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 5 & -1 & 5 & 3 \end{bmatrix}$$