

## Elementary Matrices- HW Problems

1. Identify which of the following matrices are elementary matrices.

a.  $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$     b.  $\begin{bmatrix} 3 & 0 \\ 0 & -2 \end{bmatrix}$     c.  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 3 & 1 \end{bmatrix}$     d.  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

2. Let

$$A = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 2 & 3 \\ 2 & -2 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 2 & -2 & 1 \\ -1 & -4 & 3 \\ 2 & -4 & 1 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & -2 & 1 \\ 3 & -12 & 5 \\ 2 & -4 & 1 \end{bmatrix}.$$

Find elementary row/column operations that turn  $A$  into  $B$  and turn  $B$  into  $C$ . Find elementary matrices  $E$  and  $F$  such that  $AE = B$  and  $FB = C$ .

3. Let

$$A = \begin{bmatrix} 1 & 1 & 0 \\ -2 & 1 & 3 \\ 4 & 2 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 1 & 0 \\ 6 & 5 & 1 \\ 4 & 2 & -1 \end{bmatrix}, \quad C = \begin{bmatrix} -5 & -4 & -1 \\ 6 & 5 & 1 \\ 4 & 2 & -1 \end{bmatrix}.$$

Find elementary matrices  $E$  and  $F$  such that  $EA = B$  and  $FB = C$ .

4. Find the inverse matrix of the following elementary matrices.

a.  $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$     b.  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$     c.  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & -3 \\ 0 & 0 & 1 \end{bmatrix}$

5. Let  $A = \begin{bmatrix} 1 & -2 & 2 \\ 2 & -2 & 3 \\ 2 & -3 & 3 \end{bmatrix}$ . Find a sequence of elementary row/column

operations that transforms  $A$  into the identity matrix  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ .