

Show all work.

1. **(6 points)** For each of the following pairs of matrices A and B , identify the *elementary* matrix E such that $B = EA$.

(a) **(2 points)** $A = \begin{pmatrix} 5 & 2 & -3 \\ 2 & -6 & 0 \\ 8 & 3 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 5 & 2 & -3 \\ 1 & -3 & 0 \\ 8 & 3 & 1 \end{pmatrix}$.

(b) **(2 points)** $A = \begin{pmatrix} 1 & -1 & 6 \\ 3 & 5 & 2 \\ 4 & 1 & 5 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -1 & 6 \\ 3 & 5 & 2 \\ 0 & 5 & -19 \end{pmatrix}$.

(c) **(2 points)** $A = \begin{pmatrix} 1 & 4 & 3 \\ -1 & -2 & 0 \\ 2 & 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 4 & 3 \\ 2 & 2 & 3 \\ -1 & -2 & 0 \end{pmatrix}$.

2. **(9 points)** Answer the following questions.

(a) **(6 points)** Using any technique you like, calculate the inverse of the matrix $A = \begin{pmatrix} -1 & -3 & -3 \\ 2 & 6 & 1 \\ 3 & 8 & 3 \end{pmatrix}$.

(b) **(3 points)** Making use of the result above, determine the unique solution to the matrix equation $\begin{pmatrix} -1 & -3 & -3 \\ 2 & 6 & 1 \\ 3 & 8 & 3 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 3 \\ 0 \\ -2 \end{pmatrix}$.

3. **(5 points)** Using any technique you like, calculate the determinant $\begin{vmatrix} 1 & 4 & 0 & 2 \\ 2 & -5 & 0 & 4 \\ 6 & -3 & 3 & 8 \\ 0 & 1 & 0 & 2 \end{vmatrix}$.