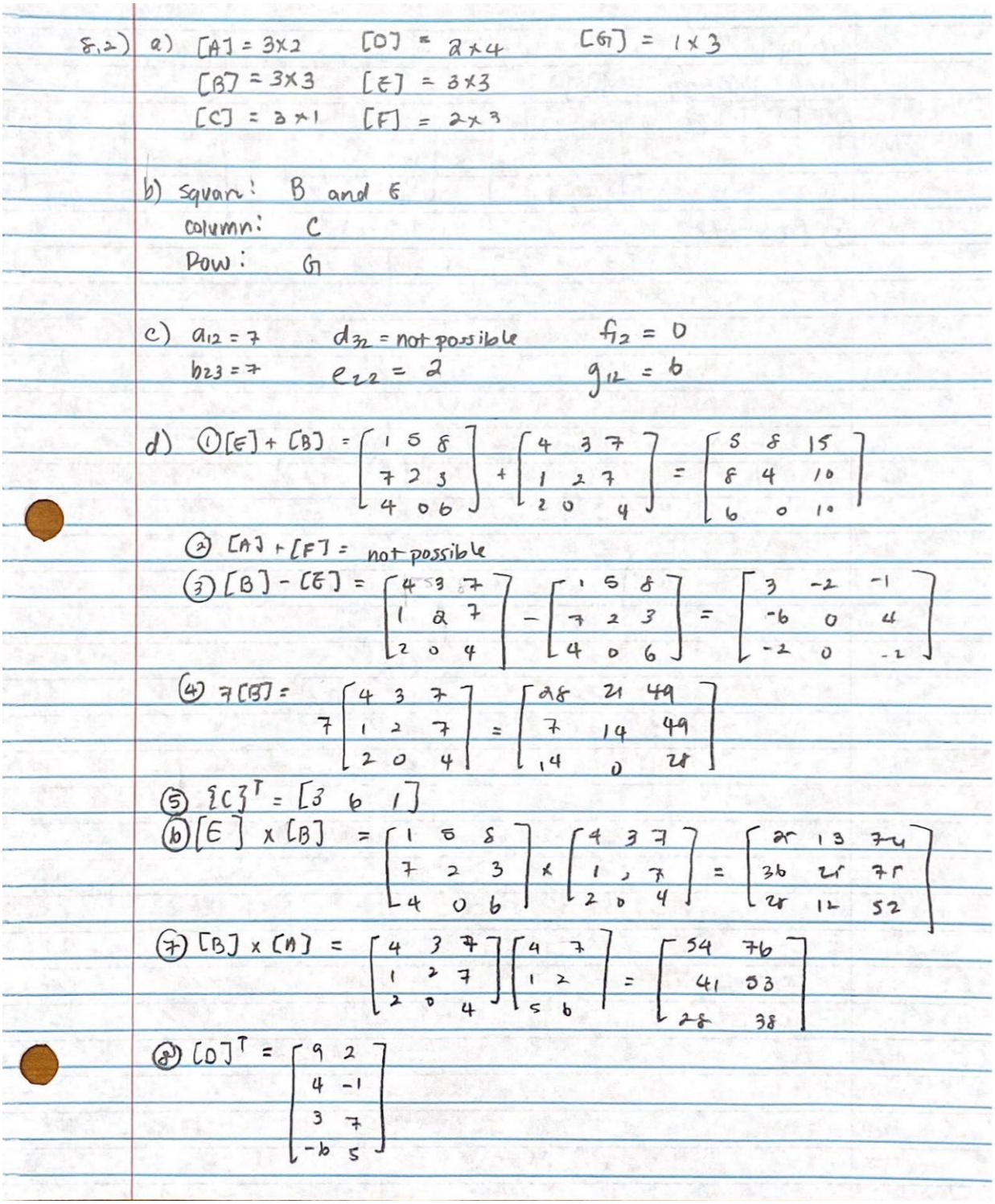
HW4 Text Solutions

1)



(9) $[A] \times \{C\} = (3\times2)(3\times1)$ = not possible

(10) $[I] \times [13] = [B]$

(11) $[E]^T \times [E] = \begin{bmatrix} 1 & 7 & 4 \\ 5 & 2 & 0 \\ 8 & 36 \end{bmatrix} \times \begin{bmatrix} 1 & 5 & 8 \\ 7 & 2 & 3 \\ 4 & 0 & 6 \end{bmatrix} = \begin{bmatrix} 66 & 19 & 53 \\ 19 & 29 & 46 \\ 53 & 46 & 109 \end{bmatrix}$

(12) $[C]^T \times [C] = [3 \ 6 \ 1] \times \begin{bmatrix} 3 \\ 6 \\ 1 \end{bmatrix} = [46]$

2a)

2) a) $2x_1 + x_2 - x_3 = -1$

$4x_1 + 2x_3 = -2$

$8x_1 + x_2 = -3$

$*A_2/A_1 = 2$ $\quad *A_3/A_1 = 4$

$$\left[\begin{array}{ccc|c} 2 & 1 & -1 & -1 \\ 4 & 0 & 2 & -2 \\ 8 & 1 & 0 & -3 \end{array}\right] \xrightarrow{A_2 - 2A_1} \left[\begin{array}{ccc|c} 2 & 1 & -1 & -1 \\ 0 & -2 & 4 & 0 \\ 8 & 1 & 0 & -3 \end{array}\right] \xrightarrow{A_3 - 4A_1} \left[\begin{array}{ccc|c} 2 & 1 & -1 & -1 \\ 0 & -2 & 4 & 0 \\ 0 & -3 & 4 & 1 \end{array}\right]$$

$*A_3/A_2 = 3/2$

$$\left[\begin{array}{ccc|c} 2 & 1 & -1 & 1 \\ 0 & -2 & 4 & 0 \\ 0 & -3 & 4 & 1 \end{array}\right] \xrightarrow{A_3 - \frac{3}{2}A_2} \left[\begin{array}{ccc|c} 2 & 1 & -1 & 1 \\ 0 & -2 & 4 & 0 \\ 0 & 0 & -2 & 1 \end{array}\right] \checkmark$$

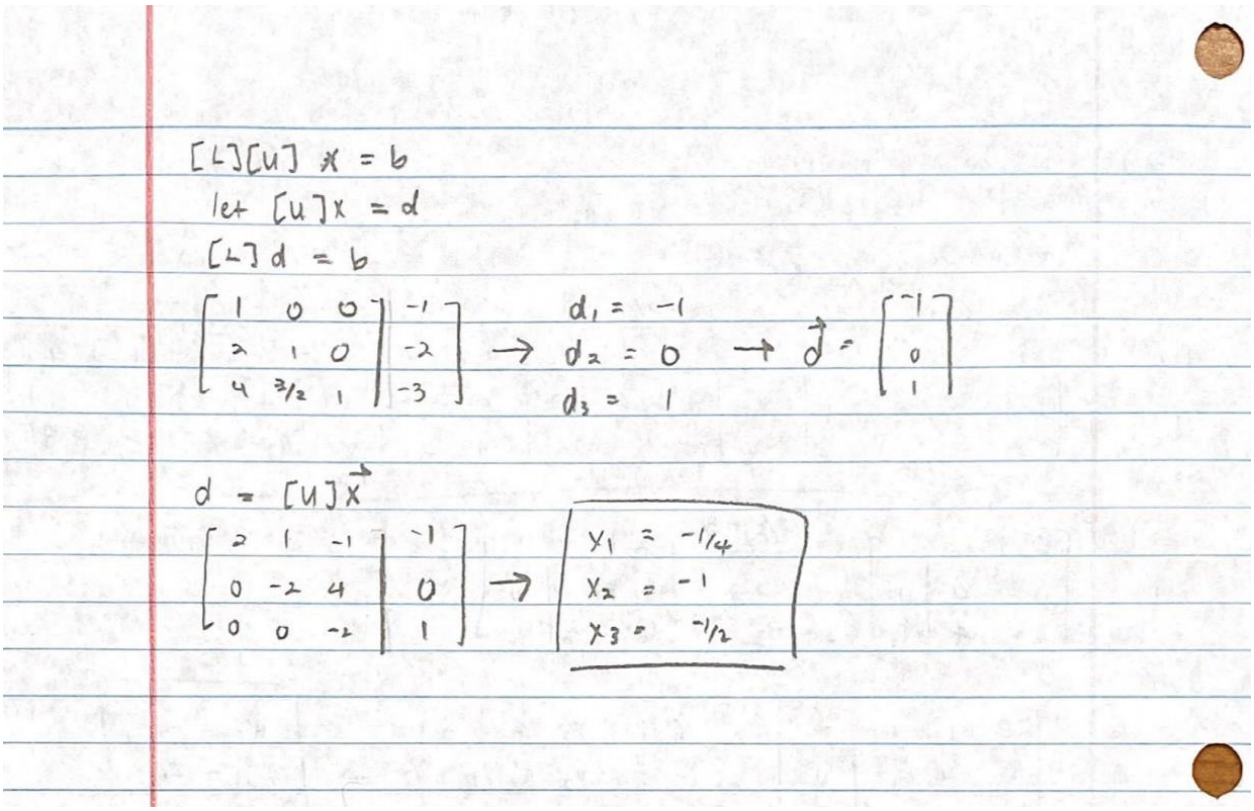
$$\left[\begin{array}{ccc|c} 2 & 1 & -1 & 1 \\ 0 & -2 & 4 & 0 \\ 0 & 0 & -2 & 1 \end{array}\right] \qquad \begin{array}{l} 2x_1 + x_2 - x_3 = 1 \\ -2x_2 + 4x_3 = 0 \\ -2x_3 = 1 \end{array} \rightarrow \boxed{\begin{array}{l} x_1 = -1/4 \\ x_2 = -1 \\ x_3 = -1/2 \end{array}}$$

b) $\begin{bmatrix} 2 & 1 & -1 \\ 4 & 0 & 2 \\ 8 & 1 & 0 \end{bmatrix} = A = [L][U]$

$$[U] = \begin{bmatrix} 2 & 1 & -1 \\ 4 & 0 & 2 \\ 8 & 1 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 2 & 1 & -1 \\ 0 & -2 & 4 \\ 0 & 0 & -2 \end{bmatrix} \checkmark$$

$$[L] = \begin{bmatrix} 1 & 0 & 0 \\ +2 & 1 & 0 \\ +4 & +3/2 & 1 \end{bmatrix} \checkmark$$

*using A_{21}, A_{31} values from part A



2f)

Problem 1: The diagonals are 0, so when factors are calculated for forward elimination, it is not possible because it would try to divide by 0.

0 + 2X2 + 3X3 = 10

X1 + 0 + 5X3 = 20

7X1 + 7X2 + 12X3 = 30

Problem 2: The diagonals are almost 0, so the factors would become infinity. So it is not possible to calculate the factor.

0.00000001X1 + 2X2 + 3X3 = 10

X1 + 0 + 5X3 = 20

7X1 + 7X2 + 12X3 = 30