

Solution to Practice 3f

B6(a)

$$A\vec{x} = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 2 & 3 \\ -1 & 1 & 0 \end{bmatrix} \begin{bmatrix} 4 \\ 0 \\ -2 \end{bmatrix} = \begin{bmatrix} (1)(4) + (0)(0) + (2)(-2) \\ (-1)(4) + (2)(0) + (3)(-2) \\ (-1)(4) + (1)(0) + (0)(-2) \end{bmatrix} = \begin{bmatrix} 0 \\ -10 \\ -4 \end{bmatrix}$$

$$A\vec{y} = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 2 & 3 \\ -1 & 1 & 0 \end{bmatrix} \begin{bmatrix} -1 \\ 1 \\ 2 \end{bmatrix} = \begin{bmatrix} (1)(-1) + (0)(1) + (2)(2) \\ (-1)(-1) + (2)(1) + (3)(2) \\ (-1)(-1) + (1)(1) + (0)(2) \end{bmatrix} = \begin{bmatrix} 3 \\ 9 \\ 2 \end{bmatrix}$$

$$A\vec{z} = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 2 & 3 \\ -1 & 1 & 0 \end{bmatrix} \begin{bmatrix} 5 \\ 1 \\ 3 \end{bmatrix} = \begin{bmatrix} (1)(5) + (0)(1) + (2)(3) \\ (-1)(5) + (2)(1) + (3)(3) \\ (-1)(5) + (1)(1) + (0)(3) \end{bmatrix} = \begin{bmatrix} 11 \\ 6 \\ -4 \end{bmatrix}$$

$$\mathbf{B6(b)} \quad A \begin{bmatrix} 4 & 1 & -5 \\ 0 & -1 & -1 \\ -2 & -2 & -3 \end{bmatrix} = [A\vec{x} \quad A\vec{y} \quad A\vec{z}] = \begin{bmatrix} 0 & 3 & 11 \\ -10 & 9 & 6 \\ -4 & 2 & -4 \end{bmatrix}$$

$$\mathbf{B9} \quad \begin{bmatrix} 1 & -1 & -2 & 4 \\ 3 & 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} 4 & 3 \\ 2 & 5 \\ 6 & 1 \\ -1 & 3 \end{bmatrix} =$$

$$\begin{bmatrix} (1)(4) + (-1)(2) + (-2)(6) + (4)(-1) & (1)(3) + (-1)(5) + (-2)(1) + (4)(3) \\ (3)(4) + (2)(2) + (1)(6) + (3)(-1) & (3)(3) + (2)(5) + (1)(1) + (3)(3) \end{bmatrix} = \begin{bmatrix} -14 & 8 \\ 19 & 29 \end{bmatrix}, \text{ and}$$

$$\begin{bmatrix} 1 & -1 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} (1)(4) + (-1)(2) & (1)(3) + (-1)(5) \\ (3)(4) + (2)(2) & (3)(3) + (2)(5) \end{bmatrix} = \begin{bmatrix} 2 & -2 \\ 16 & 19 \end{bmatrix},$$

and

$$\begin{bmatrix} -2 & 4 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 6 & 1 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} (-2)(6) + (4)(-1) & (-2)(1) + (4)(3) \\ (1)(6) + (3)(-1) & (1)(1) + (3)(3) \end{bmatrix} = \begin{bmatrix} -16 & 10 \\ 3 & 10 \end{bmatrix}.$$

And finally, we see $\begin{bmatrix} 2 & -2 \\ 16 & 19 \end{bmatrix} + \begin{bmatrix} -16 & 10 \\ 3 & 10 \end{bmatrix} = \begin{bmatrix} -14 & 8 \\ 19 & 29 \end{bmatrix}$, as desired.