

$$11.) \quad v = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} \quad w = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$$

$$[v-w] = \begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix} = \begin{bmatrix} v_1 - w_1 \\ v_2 - w_2 \\ v_3 - w_3 \end{bmatrix}$$

$$v+w = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} = \begin{bmatrix} v_1 + w_1 \\ v_2 + w_2 \\ v_3 + w_3 \end{bmatrix}$$

(a) This ~~acc~~ is a question with 6 unknown numbers and an equal number of equations.

(b) Matrix Vector Product: (6×6 matrix)

$$\begin{bmatrix} v_1 & w_1 & v_2 & w_2 & v_3 & w_3 \\ 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} v_1 \\ w_1 \\ v_2 \\ w_2 \\ v_3 \\ w_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 2 \\ 5 \\ 5 \\ 6 \\ 8 \end{bmatrix}$$

$$\underline{A} \quad \underline{x} = \underline{b}$$

$$v_1 + w_1 = 4$$

$$v_1 - w_1 = 2$$

$$v_2 + w_2 = 5$$

$$v_2 - w_2 = 5$$

$$v_3 + w_3 = 6$$

$$v_3 - w_3 = 8$$

Augmented Matrix: $[A|b]$

$$\left[\begin{array}{cccccc|c} 1 & 1 & 0 & 0 & 0 & 0 & 4 \\ 1 & -1 & 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 1 & 1 & 0 & 0 & 5 \\ 0 & 0 & 1 & -1 & 0 & 0 & 5 \\ 0 & 0 & 0 & 0 & 1 & 1 & 6 \\ 0 & 0 & 0 & 0 & 1 & -1 & 8 \end{array} \right]$$

(c) ref to compute the vectors.

$$\begin{array}{l}
 R_2 \rightarrow R_2 - R_1 \\
 R_4 \rightarrow R_4 - R_3 \\
 R_6 \rightarrow R_6 - R_5
 \end{array}
 \left(\frac{-2}{-2} \right)
 \begin{bmatrix}
 1 & 1 & 0 & 0 & 0 & 0 & 4 \\
 0 & 1 & 0 & 0 & 0 & 0 & 1 \\
 0 & 0 & 1 & 1 & 0 & 0 & 5 \\
 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 1 & 1 & 6 \\
 0 & 0 & 0 & 0 & 0 & 1 & -1
 \end{bmatrix}$$

$$\Rightarrow
 \begin{bmatrix}
 1 & 0 & 0 & 0 & 0 & 0 & 3 \\
 0 & 1 & 0 & 0 & 0 & 0 & 1 \\
 0 & 0 & 1 & 0 & 0 & 0 & 5 \\
 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 1 & 0 & 7 \\
 0 & 0 & 0 & 0 & 0 & 1 & -1
 \end{bmatrix}$$

$$\Rightarrow
 \begin{bmatrix}
 v_1 \\
 w_1 \\
 v_2 \\
 w_2 \\
 v_3 \\
 w_3
 \end{bmatrix}
 =
 \begin{bmatrix}
 3 \\
 1 \\
 5 \\
 0 \\
 7 \\
 -1
 \end{bmatrix}$$

$$V = [3, 5, 7]^T$$

$$V = \begin{bmatrix} 3 \\ 5 \\ 7 \end{bmatrix}$$

$$W = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$$