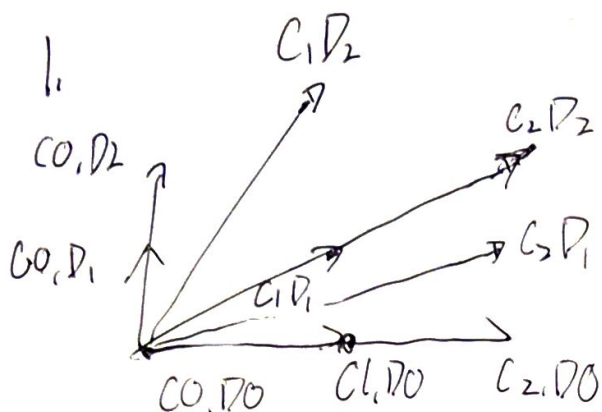


# ## EAS596 HW 2 Matthew Suh ##



2.  $(4, 5, 6) = (V_1 + W_1, V_2 + W_2, V_3 + W_3)$

a)  $(2, 5, 8) = (V_1 - W_1, V_2 - W_2, V_3 - W_3)$

ALL

$$6, 10, 14 = (2V_1, 2V_2, 2V_3)$$

$$3, 5, 7 = (V_1, V_2, V_3)$$

$$\Rightarrow V = (3, 5, 7)$$

$$W = (1, 0, -1)$$

b) 6 unknown numbers.

3. a)  $3^2 + 4^2 = 10$

$$\hat{u}_1 = \left( \frac{3}{\sqrt{10}}, \frac{4}{\sqrt{10}} \right)$$

$$2^2 + 1^2 + 2^2 = 9$$

$$\hat{u}_2 = \left( \frac{2}{3}, \frac{1}{3}, \frac{2}{3} \right)$$

3. b) let  $V_2 = (V_{2x}, V_{2y}, V_{2z})$   
 $V_1 = (V_{1x}, V_{1y})$

$$V_{1x} \times \frac{3}{\sqrt{10}} + V_{1y} \times \frac{1}{\sqrt{10}} = 0$$

$$\text{Since } V_1 \cdot \hat{u}_1 = 0$$

$$V_{1x} = \pm \frac{1}{\sqrt{10}}$$

$$V_{1y} = \pm \frac{3}{\sqrt{10}}$$

$$V_1 = \left( \frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right) \text{ or } \left( -\frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right)$$

$$\frac{2}{3}V_{2x} + \frac{1}{3}V_{2y} + \frac{2}{3}V_{2z} = 0$$

$$\text{let } V_{2x} = \frac{3}{2}, V_{2y} = 3$$

$$\frac{2}{3} \times \frac{3}{2} + \frac{1}{3} \times 3 + \frac{2}{3} \times V_{2z} = 0$$

$$V_{2z} = -6$$

$$V_2 = \left( \frac{3}{2}, 3, -6 \right)$$

4.  $\|V\| + \|W\| = 5 + 3 = 8$   
 9)  $\|V\| - \|W\| = 5 - 3 = 2$   
 Largest = 8, Smallest = 2

b)  $|V \cdot W| = \|V\| \|W\| \cos \theta \leq \|V\| \|W\| = 15$   
 $-15 \leq V \cdot W \leq 15$

5.  $1x_1 + 4x_2 + 7x_3 = 0$   
 $2x_1 + 5x_2 + 8x_3 = 0$   
 $3x_1 + 6x_2 + 9x_3 = 0$   
Dependent  
 $x_1 = 1, x_2 = -2, x_3 = 1$   
 $W_1 - 2W_2 + W_3 = 0$

6. f)  $\begin{bmatrix} 5 & 8 & 15 \\ 8 & 4 & 10 \\ 6 & 0 & 10 \end{bmatrix}$   $V_{ii}) \begin{bmatrix} 25 & 13 & 74 \\ 36 & 25 & 75 \\ 28 & 12 & 62 \end{bmatrix}$

ii) undefined  
 iii)  $\begin{bmatrix} 3 & -2 & -1 \\ -6 & 0 & 4 \\ -2 & 0 & -2 \end{bmatrix}$

vii)  $\begin{bmatrix} 36 & 17 \end{bmatrix}$

iv)  $\begin{bmatrix} 54 & 76 \\ 41 & 53 \\ 28 & 38 \end{bmatrix}$

ix) undefined  
 x)  $\begin{bmatrix} 43 & 7 \\ 12 & 7 \\ 20 & 4 \end{bmatrix}$

vi)  $\begin{bmatrix} 9 & 2 \\ 4 & -1 \\ 3 & 7 \\ -6 & 5 \end{bmatrix}$

xi)  $\begin{bmatrix} 66 & 19 & 53 \\ 19 & 29 & 46 \\ 53 & 46 & 109 \end{bmatrix}$

xii) 46

a) b) Square Matrix: BE  
 6. A:  $3 \times 2$   
 Column Matrix: C  
 B:  $3 \times 3$   
 Row Matrix: A  
 C:  $3 \times 1$   
 D:  $2 \times 4$   
 E:  $3 \times 3$   
 F:  $2 \times 3$   
 G:  $1 \times 3$

c)  $4 \det \begin{bmatrix} 2 & 7 \\ 0 & 4 \end{bmatrix} - 3 \det \begin{bmatrix} 1 & 7 \\ 2 & 4 \end{bmatrix}$   
 $+ 7 \det \begin{bmatrix} 1 & 2 \\ 2 & 0 \end{bmatrix} = 32 + 30 + (-28)$   
 $= 34$

7.  $\begin{bmatrix} 5 & 6 & 6 & 8 & 1 & 0 & 0 & 0 \\ 2 & 2 & 2 & 8 & 0 & 0 & 1 & 0 \\ 6 & 6 & 2 & 8 & 0 & 0 & 0 & 1 \\ 2 & 3 & 6 & 7 & 1 & 0 & 0 & 0 \end{bmatrix}$

$= \begin{bmatrix} -17 & -9 & 12 & 16 \\ 17 & 8.75 & -11.75 & -16 \\ -4 & -2.25 & 2.75 & 4 \\ 1 & 0.75 & -0.75 & -1 \end{bmatrix}$

d) 9  
 e)  $a_{12} = 1, b_{23} = 1, d_{32} = \text{null}$   
 $e_{22} = 2, f_{12} = 0, g_{12} = 6$

$\rightarrow C$

$$8$$

$$a) \begin{cases} x_1 + 2x_2 = b_1 \\ -2x_1 + x_2 = b_2 \end{cases}$$

$$b) \begin{bmatrix} 1 & 2 & | & 1 \\ -2 & 1 & | & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 2 & | & 1 \\ 0 & 5 & | & 2 \end{bmatrix}$$

$$5x_2 = 2 \quad x_2 = \frac{2}{5} \rightarrow \begin{bmatrix} \frac{1}{5} \\ \frac{2}{5} \end{bmatrix}$$

$$\rightarrow x_1 = \frac{1}{5}$$

$$c) \begin{bmatrix} 1 & 2 & | & 0 \\ -2 & 1 & | & 1 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 2 & | & 0 \\ 0 & 5 & | & 1 \end{bmatrix}$$

$$x_2 = \frac{1}{5}, \quad x_1 = -\frac{2}{5}$$

$$\rightarrow \begin{bmatrix} -\frac{2}{5} \\ \frac{1}{5} \end{bmatrix}$$

$$d) \begin{bmatrix} \frac{1}{5} & -\frac{2}{5} \\ \frac{2}{5} & \frac{1}{5} \end{bmatrix} \quad \det(A) = 5$$

$$\operatorname{adj}(A) = \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{5} \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{5} & -\frac{2}{5} \\ \frac{2}{5} & \frac{1}{5} \end{bmatrix} = B$$