SP1 $A=[7.2 \quad -4.3 \quad 0.6 \quad 1.7]$ $B=[-11.0 \quad 11.8 \quad 2.4 \quad -1.9]$

$$C=\begin{bmatrix} 1.7 \\ 1.0 \\ -1.0 \\ 4.3 \end{bmatrix} \qquad D=\begin{bmatrix} -2.4 \\ -0.7 \\ -6.8 \\ 3.0 \end{bmatrix}$$

$A+B=[-3.8 \quad 7.5 \quad 3 \quad -0.2]$

$$C+D=\begin{bmatrix} -0.7 \\ 0.3 \\ -7.8 \\ 7.3 \end{bmatrix}$$

$A-B=[18.2 \quad -16.1 \quad -1.8 \quad 3.6]$

$$C-D=\begin{bmatrix} 4.1 \\ 1.7 \\ 5.8 \\ 1.3 \end{bmatrix}$$

SP2

$3A=[21.6 \quad -12.9 \quad 1.8 \quad 5.1]$

$2B=[-22.0 \quad 23.6 \quad 7.2 \quad -5.7]$

$3A-2B=[43.6 \quad -36.5 \quad -5.4 \quad 10.8]=R_1$

SP2 cont:

$$5C = \begin{bmatrix} 8.5 \\ 5 \\ -5 \\ 21.5 \end{bmatrix} \quad 2D = \begin{bmatrix} -4.8 \\ -1.4 \\ -13.6 \\ 6 \end{bmatrix}$$

$$5C + 2D = \begin{bmatrix} 3.7 \\ 3.6 \\ -18.6 \\ 27.5 \end{bmatrix} = R_2$$

SP3:

$E = [7 \ -1 \ 4 \ 2 \ -8] \quad F = [1 \ 2 \ 9 \ 0 \ -4]$

$2E = [14 \ -2 \ 8 \ 4 \ -16] \quad 3F [3 \ 6 \ 27 \ 0 \ -12]$

$2E - 3F = [11 \ -8 \ -19 \ 4 \ -4]$

$2E - 3F + R3 = 0$

So

$R3 = [-11 \ 8 \ 19 \ -4 \ 4]$

SP4:

$A \cdot B = (7.2)(-11) + (-4.3)(1.8) + (0.6)(2.4) + (1.7)(-1.9)$

$A \cdot B = -131.73$

$2A = [14.4 \ -8.6 \ 1.2 \ 3.4]$

$2A + B = [3.4 \ 3.2 \ 3.6 \ 1.5]$

$R = (-131.73)(2A + B) = [-447.82 \ -421.536 \ -474.228 \ -197.595]$

SP5:

$G = [2 \ -3 \ 5] \quad H = [1 \ 4 \ -2]$

$|G| = \sqrt{(2)^2 + (-3)^2 + (5)^2} = \sqrt{38}$

$\cos\theta = \frac{G \cdot H}{|G||H|}$

$= \frac{2 - 7 - 10}{\sqrt{(1)^2 + (4)^2 + (-2)^2} \cdot \sqrt{38}} = \boxed{\frac{-15}{\sqrt{21}}}$

$\theta = \cos^{-1}\left(\frac{-15}{\sqrt{38} \cdot \sqrt{21}}\right) = \boxed{122.07°}$

SP6:

$A = \begin{bmatrix} 2 & -1 \\ 0 & 3 \\ -4 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 4 & -3 \\ 1 & 2 \\ -2 & -5 \end{bmatrix}$

$3A = \begin{bmatrix} 6 & -3 \\ 0 & 9 \\ -12 & 3 \end{bmatrix} \quad 2B = \begin{bmatrix} 8 & -6 \\ 2 & 4 \\ -4 & -10 \end{bmatrix}$

$C = 3A - 2B = \begin{bmatrix} -2 & 3 \\ -2 & 5 \\ -8 & 13 \end{bmatrix}$

SP7:

$C = \begin{bmatrix} 4 & 0 & -2 & 1 \\ 3 & -2 & 4 & 3 \end{bmatrix} \quad D = \begin{bmatrix} 3 \\ -2 \\ 1 \\ 4 \end{bmatrix}$

$CD = \begin{matrix} 4(3) + 0 - 2 + 4 \\ 3(3) + 4 + 4 + 12 \end{matrix} = \begin{bmatrix} 14 \\ 29 \end{bmatrix}$

SP8: Not possible to solve due to matrix size

SP9: $F=\begin{bmatrix}-1 & 2 & 2 & 6\\ 7 & -3 & -4 & 0\end{bmatrix}$ $G=\begin{bmatrix}6 & 3\\ -1 & 0\\ 0 & -4\\ 2 & 1\end{bmatrix}$

$$FG=\begin{matrix}-1(6)+2(-1)+2(0)+6(2) & -1(3)+2(0)+2(-4)+6(1)\\ 7(6)+-3(-1)+-4(0)+0(2) & 7(3)-3(0)-4(-4)+0(1)\end{matrix}$$

$$FG=\begin{bmatrix}4 & -5\\ 45 & 37\end{bmatrix}.$$

$$GF=\begin{bmatrix}6(-1)+3(7) & 6(2)+3(-3) & 6(2)+3(-4) & 6(6)+3(0)\\ -1(-1)+0(7) & -1(2)+0(-3) & -1(2)+0(-4) & -1(6)+0(0)\\ 0(-1)+-4(7) & 0(2)+-4(-3) & 0(2)+-4(-4) & 0(6)+-4(0)\\ 2(-1)+1(7) & 2(2)+1(-3) & 2(2)+1(-4) & 2(6)+1(0)\end{bmatrix}$$

$$GF=\begin{bmatrix}15 & 3 & 0 & 36\\ 1 & -2 & -2 & -6\\ -28 & 12 & 16 & 0\\ 5 & 1 & 0 & 12\end{bmatrix}$$

SP10:

$$H = \begin{bmatrix} 1 & 3 & 0 \\ 2 & -1 & 0 \\ 3 & 2 & 0 \end{bmatrix} \quad J = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 2 & 5 & 7 \end{bmatrix}$$

$$HJ = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$JH = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 33 & 15 & 0 \end{bmatrix}$$

SP11:

$$B_1 = \begin{bmatrix} -4 & 1 \\ 2 & 3 \end{bmatrix} \quad B_2 = \begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix} \quad B_3 = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$$

$$B_{123} = \begin{bmatrix} -17 & -12 \\ 19 & -36 \end{bmatrix} \quad B_{123}^{+} = \begin{bmatrix} -17 & 19 \\ -12 & -36 \end{bmatrix}$$

$$B_1^{+} = \begin{bmatrix} -4 & 2 \\ 1 & 3 \end{bmatrix} \quad B_2^{+} \begin{bmatrix} 2 & 0 \\ 1 & -3 \end{bmatrix} \quad B_3^{+} = \begin{bmatrix} 3 & -1 \\ -2 & 4 \end{bmatrix}$$

$$B_{123}^{+} = \begin{bmatrix} -17 & 19 \\ -12 & -35 \end{bmatrix}$$

Sp12:

$$\begin{pmatrix} 1 & 2 & 3 & | & 5 \\ 3 & 1 & -3 & | & 4 \\ -3 & 4 & 7 & | & 7 \end{pmatrix}$$

$D = 1\begin{vmatrix} 1 & -3 \\ 4 & 7 \end{vmatrix} - (2)\begin{vmatrix} 3 & -3 \\ -3 & 7 \end{vmatrix} + 3\begin{vmatrix} 3 & 1 \\ -3 & 4 \end{vmatrix}$

$19 - 22 + 27$ $\quad 49 - 19 = 30$

$D = 30$

$$D_x = \begin{vmatrix} 5 & 2 & 3 \\ 4 & 1 & -3 \\ 7 & 4 & 7 \end{vmatrix} = 5\begin{vmatrix} 1 & -3 \\ 4 & 7 \end{vmatrix} - (2)\begin{vmatrix} 4 & -3 \\ 7 & 7 \end{vmatrix} + (3)\begin{vmatrix} 4 & 1 \\ 7 & 4 \end{vmatrix}$$

$(5)(19) - (2)(49) + 3(9) =$

$95 - 98 + 27 = 24$

$x = \frac{24}{30} = 0.8 = \frac{4}{5}$

$$D_y = \begin{vmatrix} 1 & 5 & 3 \\ 3 & 4 & -3 \\ -3 & 7 & 7 \end{vmatrix} = 1\begin{vmatrix} 4 & -3 \\ 7 & 7 \end{vmatrix} - (5)\begin{vmatrix} 3 & -3 \\ -3 & 7 \end{vmatrix} + (3)\begin{vmatrix} 3 & 4 \\ -3 & 7 \end{vmatrix}$$

$1(49) - (5)12 + 3(33) = 88$

$y = \frac{88}{30} = \frac{44}{15}$

$$D_z = \begin{pmatrix} 1 & 2 & 5 \\ 3 & 1 & 4 \\ -3 & 4 & 7 \end{pmatrix} = 1\begin{vmatrix} 1 & 4 \\ 4 & 7 \end{vmatrix} - (2)\begin{vmatrix} 3 & 4 \\ -3 & 7 \end{vmatrix} + (5)\begin{vmatrix} 3 & 1 \\ -3 & 4 \end{vmatrix}$$

$1(-9) - (2)(33) + 75 = 0$

$z = \frac{0}{30} = 0$