1. a) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 4 & -1 \\ 1 & 4 \end{bmatrix} = \begin{pmatrix} 1+4 & 0-1 \\ 1+1 & 1+4 \end{pmatrix} = \begin{pmatrix} 5 & -1 \\ 2 & 5 \end{pmatrix}$ //.

b) $\begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix} - \begin{bmatrix} 2 & -1 \\ 1 & -2 \end{bmatrix} = \begin{pmatrix} 2-2 & 0-(-1) \\ 1-1 & 1-(-2) \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 0 & 3 \end{pmatrix}$ //.

c) $-8 \begin{pmatrix} -1 & 0 \\ 2 & 1 \end{pmatrix} = \begin{pmatrix} -8(-1) & -8(0) \\ -8(2) & -8(1) \end{pmatrix} = \begin{pmatrix} 8 & 0 \\ -16 & 8 \end{pmatrix}$ //.

d) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} -2 & 1 \\ -1 & 2 \end{bmatrix} = \begin{pmatrix} (1)(-2)+(0)(-1) & (1)(1)+(0)(2) \\ (1)(-2)+(1)(-1) & (1)(1)+(1)(2) \end{pmatrix}$

$= \begin{pmatrix} -2 & 1 \\ -3 & 3 \end{pmatrix}$ //.

2. $\begin{vmatrix} c & 4 \\ 6 & 5 \end{vmatrix} = 5(c) - 6(4)$

$= 5c - 24$ //.

3. a) $B = \begin{bmatrix} 4 & -1 \\ 1 & 4 \end{bmatrix} = (4)(4) - (-1)(1)$

$= 16 - (-1)$

$= 17$

b) $\begin{pmatrix} 2 & 1 & 2 \\ 1 & 7 & 3 \\ -4 & 3 & 1 \end{pmatrix} =$

b) $\begin{vmatrix} 2 & 1 & 2 \\ 1 & 7 & 3 \\ -4 & 3 & 1 \end{vmatrix} \overset{C_1 - 2C_2}{=} \begin{vmatrix} 0 & 1 & 2 \\ -13 & 7 & 3 \\ -10 & 3 & 1 \end{vmatrix} \overset{C_3 - 2C_2}{=} \begin{vmatrix} 0 & 1 & 0 \\ -13 & 7 & -11 \\ -10 & 3 & -5 \end{vmatrix}$

NOW use determinant

$$0 \cdot (-1)^2 \begin{vmatrix} 7 & -11 \\ 3 & -5 \end{vmatrix} + (1) \cdot (-1)^3 \begin{vmatrix} -13 & -11 \\ -10 & -5 \end{vmatrix} + 0 \cdot (-1)^4 \begin{vmatrix} -13 & 7 \\ -10 & 3 \end{vmatrix}$$

$$= (-1) \begin{vmatrix} -13 & -11 \\ -10 & -5 \end{vmatrix} = -13(-15) - (-11)(-10)$$

$$= 45$$

3a) $\vec{RS} = \vec{OS} - \vec{OR} = (-\vec{i} - 10\vec{j}) - (7\vec{i} + 2\vec{j})$

$= (-1-7)\vec{i} + (-10-2)\vec{j}$

$= -8\vec{i} + -12\vec{j}$

$= -8\vec{i} - 12\vec{j}$ Direction

Mag $|\vec{RS}| = \sqrt{(-8)^2 + (-12)^2} = \sqrt{64+144} = \sqrt{208}$

$= 4\sqrt{13}$ //.

$\cos\theta = \dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|} = \dfrac{(7)(-1)+(2)(-10)}{\sqrt{7^2+(-1)^2}\ \sqrt{2^2+(-10)^2}} = \dfrac{-27}{\sqrt{50}\sqrt{104}}$

$\theta = \cos^{-1}\left(\dfrac{-27}{\sqrt{50}\sqrt{104}}\right) = 111.65°$

3b) $\vec{PQ} = \vec{OQ} - \vec{OP} = (-5\vec{i} + 2\vec{j}) - (-4\vec{i} - 10\vec{j})$

$= (-5 - (-4))\vec{i} + (2 - (-10))\vec{j} = -\vec{i} + 12\vec{j}$ Direction

Mag $|\vec{PQ}| = \sqrt{(-1)^2 + (12)^2} = \sqrt{1 + 144} = \sqrt{145}$

$\cos\theta = \dfrac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|} = \dfrac{(-5)(-4) + (2)(-10)}{\sqrt{(-5)^2 + (2)^2}\sqrt{(-4)^2 + (-10)^2}} = \dfrac{20 + (-20)}{\sqrt{29}\sqrt{116}} = 0$

$\cos^{-1}(0) = \theta \quad \theta = 90°$