Problem 1

$$\begin{cases} x_1 + x_2 - 2x_3 = 9 \\ 2x_1 + 4x_2 - 3x_3 = 1 \\ 3x_1 + 6x_2 - 5x_3 = 0 \end{cases}$$

$R_2 - 2R_1$ & $R_3 - 3R_1$

$$\begin{cases} x_1 + x_2 - 2x_3 = 9 \\ 2x_2 + x_3 = -17 \\ 3x_2 + x_3 = -27 \end{cases}$$

$2R_3 - 3R_2$

$$\begin{cases} x_1 + x_2 - 2x_3 = 9 \\ 2x_2 + x_3 = -17 \\ -x_3 = -3 \end{cases}$$

$$x_3 = 3$$

$$2x_2 + 3 = -17$$

$$2x_2 = -20$$

$$x_2 = -10$$

$$x_1 + x_2 - 2x_3 = 9$$

$$x_1 - 10 - 2(3) = 9$$

$$x_1 = 9 + 6 + 10$$

$$x_1 = 25$$

Solution set : $(25, -10, 3)$

Problem 2

$$A+B = \begin{bmatrix} 4 & 6 & -2 \\ 4 & -3 & 5 \end{bmatrix}$$

$$C+B^T = \begin{bmatrix} 2 & 4 \\ 4 & 0 \\ -2 & 2 \end{bmatrix} + \begin{bmatrix} 3 & -2 \\ 2 & -6 \\ 1 & 5 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 2 \\ 6 & -6 \\ -1 & 7 \end{bmatrix}$$

$$-2AC = -2 \begin{bmatrix} 1 & 4 & -3 \\ 6 & 3 & 0 \end{bmatrix} \begin{bmatrix} 2 & 4 \\ 4 & 0 \\ -2 & 2 \end{bmatrix}$$

$2 + 16 + 6$

$$= -2 \begin{bmatrix} 24 & -2 \\ 24 & 24 \end{bmatrix}$$

$$= \begin{bmatrix} -48 & 4 \\ -48 & -48 \end{bmatrix}$$

Problem 3

$$4 - 3x = -2$$

$$6 = 3x$$

$$x = 2$$

Problem 4

$$\left[\begin{array}{cccc|c} 2 & 3 & -1 & -9 & -16 \\ 1 & 2 & 1 & 0 & 0 \\ 1 & -2 & -3 & -4 & -8 \end{array}\right]$$

$R_2 \to R_1 - 2R_2$ & $R_3 \to R_3 - R_2$

$$\left[\begin{array}{cccc|c} 2 & 3 & -1 & -9 & -16 \\ 0 & -1 & -3 & -9 & -16 \\ 0 & -4 & -4 & -4 & -8 \end{array}\right]$$

$R_3 \to -R_3/4$

$$\left[\begin{array}{cccc|c} 2 & 3 & -1 & -9 & -16 \\ 0 & -1 & -3 & -9 & -16 \\ 0 & 1 & 1 & 1 & 2 \end{array}\right]$$

$R_3 \to R_2 + R_3$ $\quad$ $R_3 \to -R_3/2$

$$\left[\begin{array}{cccc|c} 2 & 3 & -1 & -9 & -16 \\ 0 & -1 & -3 & -9 & -16 \\ 0 & 0 & 1 & 4 & 7 \end{array}\right]$$

$x_3 + 4x_4 = 7$

Let $x_4 = t$

$x_3 = 7 - 4t$

$-x_2 - 3(7 - 4t) - 9t = -16$

$-x_2 - 21 + 12t - 9t = -16$

$$-x_2 - 21 + 3t = -16$$

$$-x_2 = -16 + 21 - 3t$$

$$x_2 = 3t - 5$$

$$2x_1 + 3(3t - 5) - (7 - 4t) - 9t = -16$$

$$2x_1 + 9t - 15 - 7 + 4t - 9t = -16$$

$$2x_1 = 6 - 4t$$

$$x_1 = 3 - 2t$$

Solution Set $= (3 - 2t, -5 + 3t, 7 - 4t, t)$