4)a) Linear, as the points on the scatterplot look like they follow a linear pattern

b) $Ax = b \Rightarrow A^TA\bar{x} = A^Tb$

$$A^TA = \begin{bmatrix} 20 & 30 & 40 & 60 & 70 & 90 & 100 & 120 & 150 & 180 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 20 & 1 \\ 30 & 1 \\ 40 & 1 \\ 60 & 1 \\ 70 & 1 \\ 90 & 1 \\ 100 & 1 \\ 120 & 1 \\ 150 & 1 \\ 180 & 1 \end{bmatrix}$$

$$A^TAx = \begin{bmatrix} 98800 & 860 \\ 860 & 10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

$$A^Tx_2 = A^T \begin{bmatrix} 3.5 \\ 7.4 \\ 7.1 \\ 15.6 \\ 11.1 \\ 14.9 \\ 23.5 \\ 27.1 \\ 22.1 \\ 32.9 \end{bmatrix} = \begin{bmatrix} 18469 \\ 165.2 \end{bmatrix}$$

$$A^TA\bar{x} = A^Tb$$

$$\begin{bmatrix} 98800 & 860 \\ 860 & 10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 18469 \\ 165.2 \end{bmatrix}$$

$$\begin{bmatrix} 98800 & 860 & | & 18469 \\ 860 & 10 & | & 165.2 \end{bmatrix} \quad R_2 = R_2 - \frac{860}{98800} R_1$$

$$\begin{bmatrix} 98800 & 860 & | & 18469 \\ 0 & 2.51417 & | & 4.4375 \end{bmatrix}$$

$$2.51417\, x_2 = 4.4375$$

$$x_2 = 1.76499$$

$$98800\, x_1 + 860(1.76499) = 18469$$

$$x_1 = 0.17156$$

$$F(x) = 0.17156\, x + 1.76499$$

4)c) $F(45) = 0.17156(45) + 1.76499$

$$= 9.48519$$