Assignment: Find the Line by finding the m and c using Linear Algebra.

Bed Rooms	2	1	3	5
House Price	45	40	60	75

$y = mx + c$

y : House Price (dependent)

x : Bed Rooms (Independent)

m : Slope

c : y-intercept

① Representing above problem in matrix representation.

$$\underset{4\times 2}{\begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 3 & 1 \\ 5 & 1 \end{bmatrix}} \underset{2\times 1}{\begin{bmatrix} m \\ c \end{bmatrix}} = \underset{4\times 1}{\begin{bmatrix} 45 \\ 40 \\ 60 \\ 75 \end{bmatrix}}$$

② Trying to apply invers mutiplication on both sides. A^{-1}

(*) A^{-1} of matrix possible only if it in square shape

Hence it's not possible.

③ next possibility is mutiplying A^T on both sides

$$\underset{2\times 4}{\begin{bmatrix} 2 & 1 & 3 & 5 \\ 1 & 1 & 1 & 1 \end{bmatrix}} \underset{4\times 2}{\begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 3 & 1 \\ 5 & 1 \end{bmatrix}} \underset{2\times 1}{\begin{bmatrix} m \\ c \end{bmatrix}} = \underset{2\times 4}{\begin{bmatrix} 2 & 1 & 3 & 5 \\ 1 & 1 & 1 & 1 \end{bmatrix}} \underset{4\times 1}{\begin{bmatrix} 45 \\ 40 \\ 60 \\ 75 \end{bmatrix}}$$

$$\underset{2\times 2}{\begin{bmatrix} 39 & 11 \\ 11 & 4 \end{bmatrix}} \underset{2\times 1}{\begin{bmatrix} m \\ c \end{bmatrix}} = \underset{2\times 1}{\begin{bmatrix} 685 \\ 220 \end{bmatrix}}$$

(4) As matix is in square shape, Now we can apply the A^{-1} multiplication

$$\begin{bmatrix} 39 & 11 \\ 11 & 4 \end{bmatrix}^{-1} \begin{bmatrix} 39 & 11 \\ 11 & 4 \end{bmatrix} \begin{bmatrix} m \\ c \end{bmatrix} = \begin{bmatrix} 39 & 11 \\ 11 & 4 \end{bmatrix}^{-1} \begin{bmatrix} 685 \\ 220 \end{bmatrix}$$

$2\times2 \quad 2\times2 \quad 2\times1 \quad 2\times2 \quad 2\times1$

$$\begin{bmatrix} 0.1142 & -0.3142 \\ -0.3142 & 1.1142 \end{bmatrix} \begin{bmatrix} 39 & 11 \\ 11 & 4 \end{bmatrix} \begin{bmatrix} m \\ c \end{bmatrix} = \begin{bmatrix} 0.1142 & -0.3142 \\ -0.3142 & 1.1142 \end{bmatrix} \begin{bmatrix} 685 \\ 220 \end{bmatrix}$$

$2\times2 \quad 2\times2 \quad 2\times1 \quad 2\times2 \quad 2\times1$

$$\begin{bmatrix} 1.642 & 473 \\ 473 & 137 \end{bmatrix}$$

$$\begin{bmatrix} 0.99 & 0 \\ 0 & 0.99 \end{bmatrix} \begin{bmatrix} m \\ c \end{bmatrix} = \begin{bmatrix} 9.142 \\ 29.857 \end{bmatrix}$$

$$0.99m = 9.142$$

$$m = 9.142 / 0.99$$

$$= 9.234$$

$$0.99c = 29.857$$

$$c = 29.857 / 0.99$$

$$= 30.158$$

$$y = mx + c$$

$x = 2$: $y = (9.234)(2) + 30.158$

$$= 48.626 \cong 45$$