Step-1

Given points are

$y = 2$ at $t = -1$
$y = 0$ at $t = 0$
$y = -3$ at $t = 1$
$y = -5$ at $t = 2$

We have to find the best straight line fit to the given measurements.

Step-2

First we write the equations that would hold if a line could go through all four points.

Then every $C + Dt + Et^2$ would agree exactly with b.

Now $Ax = b$ is

$$C + D(-1) + E(-1)^2 = 2$$
$$C + D(0) + E(0)^2 = 0$$
$$C + D(1) + E(1)^2 = -3$$
$$C + D(2) + E(2)^2 = -5$$

Step-3

The matrix from of the above system is

$$\begin{bmatrix} 1 & -1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix} \begin{bmatrix} C \\ D \\ E \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ -3 \\ -5 \end{bmatrix}$$

Hence the coefficient matrix $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 2 & 4 \end{bmatrix}$,

The unknown vector $x = \begin{bmatrix} C \\ D \\ E \end{bmatrix}$ and

The data vector $b = \begin{bmatrix} 2 \\ 0 \\ -3 \\ -5 \end{bmatrix}$