

6 points

$$\begin{aligned} \textcircled{2} \quad a_1 + a_0 &= 0 \\ 6a_1 + a_0 &= 6 \end{aligned} \quad \begin{bmatrix} 1 & 1 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} a_1 \\ a_0 \end{bmatrix} = \begin{bmatrix} 0 \\ 6 \end{bmatrix}$$

$$\textcircled{3} \quad a_1 = \frac{\begin{vmatrix} 0 & 1 \\ 6 & 1 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ 6 & 1 \end{vmatrix}} = \frac{-6}{-5} = \frac{6}{5} \quad a_0 = \frac{\begin{vmatrix} 1 & 0 \\ 6 & 6 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ 6 & 1 \end{vmatrix}} = \frac{6}{-5} = -\frac{6}{5} \quad \boxed{y = \frac{6}{5}x - \frac{6}{5}}$$

$$\begin{aligned} \textcircled{4} \quad a_1 + a_0 &= 0 \\ 2a_1 + a_0 &= 2 \\ 3a_1 + a_0 &= 2 \\ 4a_1 + a_0 &= 3 \\ 5a_1 + a_0 &= 5 \\ 6a_1 + a_0 &= 6 \end{aligned} \quad \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 3 & 1 \\ 4 & 1 \\ 5 & 1 \\ 6 & 1 \end{bmatrix} \begin{bmatrix} a_1 \\ a_0 \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \\ 2 \\ 3 \\ 5 \\ 6 \end{bmatrix}$$

Label 0

$$A^T A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 3 & 1 \\ 4 & 1 \\ 5 & 1 \\ 6 & 1 \end{bmatrix} = \begin{bmatrix} 91 & 21 \\ 21 & 6 \end{bmatrix} \quad (A^T A)^{-1} = \frac{1}{105} \begin{bmatrix} 6 & -21 \\ -21 & 91 \end{bmatrix}$$

$$\begin{aligned} A^T \vec{b} &= \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ 2 \\ 3 \\ 5 \\ 6 \end{bmatrix} = \begin{bmatrix} 83 \\ 18 \end{bmatrix} \\ \bar{x} &= (A^T A)^{-1} A^T \vec{b} = \frac{1}{105} \begin{bmatrix} 6 & -21 \\ -21 & 91 \end{bmatrix} \begin{bmatrix} 83 \\ 18 \end{bmatrix} \\ &= \frac{1}{105} \begin{bmatrix} 120 \\ -105 \end{bmatrix} = \begin{bmatrix} \frac{24}{21} \\ -1 \end{bmatrix} \\ &= \begin{bmatrix} 1.14 \\ -1 \end{bmatrix} \end{aligned}$$

⑤ $y = 1.14x - 1$

⑥ $\vec{b} - A\vec{x} = \begin{bmatrix} 0 \\ 2 \\ 2 \\ 3 \\ 5 \\ 6 \end{bmatrix} - \begin{bmatrix} 0.14 \\ 1.28 \\ 2.42 \\ 3.56 \\ 4.70 \\ 5.84 \end{bmatrix} = \begin{bmatrix} -0.14 \\ 0.72 \\ -0.42 \\ -0.56 \\ 0.30 \\ 0.16 \end{bmatrix}$

⑦ $\|\vec{b} - A\vec{x}\| = 1.0694$