2

$$y = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \quad r_{11} = |y_1| = \sqrt{1+1+1+1} = 2$$

$$\Rightarrow q_1 = \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{bmatrix}$$

$$r_{12} = (a_2, q_1) = \frac{1}{2} + \frac{9}{2} + \frac{9}{2} + \frac{1}{2} = 10$$

$$y = a_2 - r_{12} q_1 = \begin{bmatrix} 1 \\ 9 \\ 9 \\ 1 \end{bmatrix} - \begin{bmatrix} 5 \\ 5 \\ 5 \\ 5 \end{bmatrix} = \begin{bmatrix} -4 \\ 4 \\ 4 \\ -4 \end{bmatrix}$$

$$r_{22} = |y_1| = 8$$

$$\Rightarrow q_2 = \begin{bmatrix} -\frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ -\frac{1}{2} \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1 & 1 \\ 1 & 9 \\ 1 & 9 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & -\frac{1}{2} \end{bmatrix} \begin{bmatrix} 2 & 10 \\ 0 & 8 \end{bmatrix}$$

1

$$\begin{aligned} c_1 + c_2 &= 1 \\ c_1 + c_3 &= 3 \\ c_1 - c_2 &= 2 \\ c_1 - c_3 &= 0 \end{aligned}$$

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix} \qquad b = \begin{bmatrix} 1 \\ 3 \\ 2 \\ 0 \end{bmatrix}$$

$$A^T A x = A^T b$$

$$\Rightarrow \begin{bmatrix} 4 & & \\ & 2 & \\ & & 2 \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} = \begin{bmatrix} 6 \\ -1 \\ 3 \end{bmatrix}$$

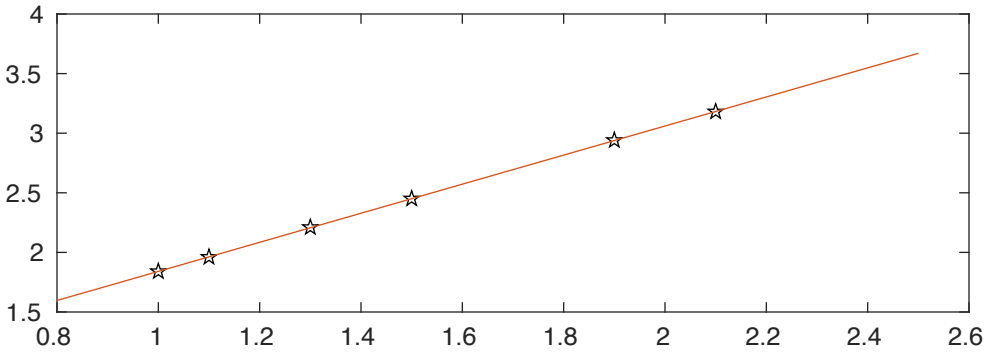
$$\Rightarrow \quad c_1 = \frac{3}{2}$$

$$c_2 = -\frac{1}{2}$$

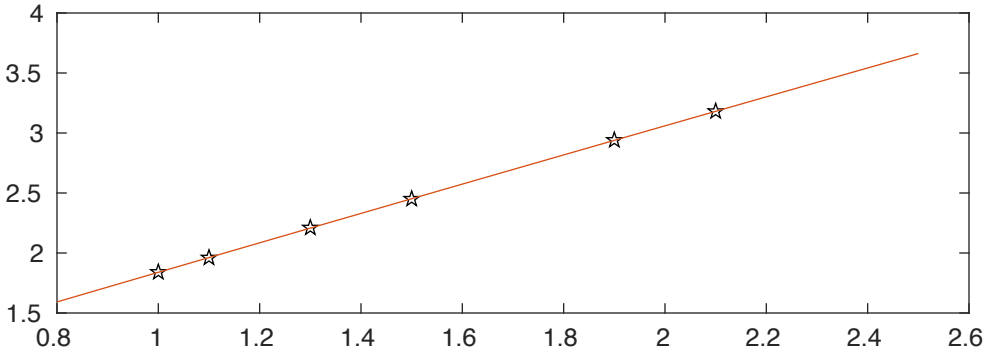
$$c_3 = \frac{3}{2}$$

$$r = b - Ax = 0 \quad \Rightarrow \quad RMSE = 0$$

linear: p(x)=0.6209+1.2196x; SE=2.7194E-5



quadratic: p=0.5966+1.2533x-0.0109x^2; SE=1.8015E-5



cubic: p=0.6290+1.1850x+0.0353x^2-0.01x^3; SE=1.7407E-5