

# ch3 作业

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P6 T1

解: 求方程组的最小二乘解, 即:

$$\text{令 } Q = (x_1 + 2x_2 - 1)^2 + (x_1 + x_2)^2 + (x_1 - x_2 - 1)^2 \text{ 最小,}$$

$$\frac{\partial Q}{\partial x_1} = 2(x_1 + 2x_2 - 1) + 2(x_1 + x_2) + 2(x_1 - x_2 - 1) = 6x_1 + 4x_2 - 4 = 0$$

$$\frac{\partial Q}{\partial x_2} = 4(x_1 + 2x_2 - 1) + 2(x_1 + x_2) - 2(x_1 - x_2 - 1) = 4x_1 + 12x_2 - 2 = 0$$

$$\therefore \begin{cases} 3x_1 + 2x_2 - 2 = 0 \\ 2x_1 + 6x_2 - 1 = 0 \end{cases} \text{ 解得 } \begin{cases} x_1 = \frac{7}{5} \\ x_2 = -\frac{3}{10} \end{cases}$$

P6 T2

解: 令  $Y = y$ ,  $X = x^2$ , 则有:  $Y = a + bX$

X	361	625	961	1444	1936
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Y	19	32.3	49	73.3	97.8
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$$S_1 = \sum_{i=1}^n X_i = 5327 \quad S_2 = \sum_{i=1}^n Y_i = 271.4 \quad S_3 = \sum_{i=1}^n X_i^2 = 7277699 \quad S_4 = \sum_{i=1}^n X_i Y_i = 369321.5$$

$$\therefore a = \frac{S_2 S_3 - S_1 S_4}{n S_3 - S_1^2} = 10.618 \quad b = \frac{n S_4 - S_1 S_2}{n S_3 - S_1^2} = 0.043$$

$$\therefore y = 10.618 + 0.043x^2$$

P6 T3

解: 令  $\frac{1}{y} = a + bx$ ,  $Y = \frac{1}{y}$ ,  $X = x$   $\therefore Y = a + bX$

X	1	1.4	1.8	2.2	2.6
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Y	1.074	2.114	3.367	4.464	5.752
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n

n

n

n

$Y$  1.074 2.114 3.367 4.464 5.952

$$\therefore S_1 = \sum_{i=1}^n X_i = 9 \quad S_2 = \sum_{i=1}^n Y_i = 16.971 \quad S_3 = \sum_{i=1}^n X_i^2 = 17.8 \quad S_4 = \sum_{i=1}^n X_i Y_i = 35.396$$

$$\therefore a = \frac{S_2 S_3 - S_1 S_4}{n S_3 - S_1^2} = -2.053 \quad b = \frac{n S_4 - S_1 S_2}{n S_3 - S_1^2} = 3.026$$

$$\therefore y = \frac{1}{3.026x - 2.053}$$