第7章书面作业

吴家行 2020213991

P223. 9

解

i	0	1	2	3	4	5	6	7
x_i	-1	0	1	2	3	4	5	6
y_i	10	9	7	5	4	3	0	-1

$y = ax + b$

$n=1$, $m=7$, 列法方程：取 $\rho(x) \equiv 1$，$\sum_i y_i = 37$，$\sum_i x_i y_i = 25$

$$\begin{bmatrix} (1,1) & (1,x) \\ (x,1) & (x,x) \end{bmatrix} \begin{bmatrix} b \\ a \end{bmatrix} = \begin{bmatrix} (1,f) \\ (x,f) \end{bmatrix}, \text{即} \begin{bmatrix} 8 & 20 \\ 20 & 92 \end{bmatrix} \begin{bmatrix} b \\ a \end{bmatrix} = \begin{bmatrix} 37 \\ 25 \end{bmatrix}$$

解方程组得：$a = -1.6071$

$b = 8.6429$

于是得到拟合数据的表达式 $y = -1.6071x + 8.6429$

P223. 10

i	0	1	2	3	4
x_i	0	1	2	3	4
y_i	1.5	2.5	3.5	5.0	7.5

$y = ce^{ax}$

解：两边取对数：$\ln y = \ln c + ax$

采用线性化方法得

x_i	0	1	2	3	4
y_i	1.5	2.5	3.5	5.0	7.5
$\ln(y_i)$	0.4055	0.9163	1.2528	1.6094	2.0149

$$\begin{bmatrix} (1,1) & (1,x) \\ (x,1) & (x,x) \end{bmatrix} \begin{bmatrix} \ln c \\ a \end{bmatrix} = \begin{bmatrix} (1,f) \\ (x,f) \end{bmatrix}$$

$$\text{即} \begin{bmatrix} 5 & 10 \\ 10 & 30 \end{bmatrix} \begin{bmatrix} \ln c \\ a \end{bmatrix} = \begin{bmatrix} 6.1989 \\ 16.3097 \end{bmatrix}$$

$\sum_i \ln(y_i) = 6.1989$

$\sum_i x_i \ln(y_i) = 16.3097$

解得：$\ln c = 0.4574$

$a = 0.3912$

$\therefore c = e^{0.4574} = 1.5800$

$\therefore y = 1.5800\, e^{0.3912x}$