Multiple-Choice Test

Chapter 06.03
Linear Regression

1. Given $(x_1, y_1), (x_2, y_2), ..., (x_n, y_n)$, best fitting data to $y = f(x)$ by least squares requires minimization of

   (A) $\sum_{i=1}^{n} [y_i - f(x_i)]$

   (B) $\sum_{i=1}^{n} |y_i - f(x_i)|$

   (C) $\sum_{i=1}^{n} (y_i - f(x_i))^2$

   (D) $\sum_{i=1}^{n} [y_i - \bar{y}]^2, \; \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$

2. The following data

x	1	20	30	40
y	1	400	800	1300

   is regressed with least squares regression to $y = a_0 + a_1 x$. The value of a_1 most nearly is

   (A) 27.480
   (B) 28.956
   (C) 32.625
   (D) 40.000

3. The following data is regressed with least squares regression to $y = a_1 x$. The value of a_1 most nearly is

x	1	20	30	40
y	1	400	800	1300

   (A) 27.480
   (B) 28.956
   (C) 32.625
   (D) 40.000

4. An instructor gives the same y vs. x data as given below to four students and asks them to regress the data with least squares regression to $y = a_0 + a_1 x$.

x	1	10	20	30	40
y	1	100	400	600	1200

They each come up with four different answers for the straight-line regression model. Only one is correct. The correct model is

(A) $y = 60x - 1200$
(B) $y = 30x - 200$
(C) $y = -139.43 + 29.684x$
(D) $y = 1 + 22.782x$

5. A torsion spring of a mousetrap is twisted through an angle of $180°$. The torque vs. angle data is given below.

Torsion, T (N-m)	0.110	0.189	0.230	0.250
Angle, θ (rad)	0.10	0.50	1.1	1.5

The relationship between the torque and the angle is $T = a_0 + a_1 \theta$.
The amount of strain energy stored in the mousetrap spring in Joules is

(A) 0.29872
(B) 0.41740
(C) 0.84208
(D) 1561.8

6. A scientist finds that regressing the y vs. x data given below to $y = a_o + a_1 x$ results in the coefficient of determination for the straight-line model, r^2 being zero.

x	1	3	11	17
y	2	6	22	?

The missing value for y at $x = 17$ most nearly is

(A) -2.4444
(B) 2.000
(C) 6.889
(D) 34.00

For a complete solution, refer to the links at the end of the book.