Multiple-Choice Test

Chapter 05.05
Spline Method of Interpolation

1. The following n data points, (x_1, y_1), (x_2, y_2), …….. (x_n, y_n), are given. For conducting quadratic spline interpolation the x-data needs to be
   (A) equally spaced
   (B) placed in ascending or descending order of x-values
   (C) integers
   (D) positive

2. In cubic spline interpolation,
   (A) the first derivatives of the splines are continuous at the interior data points
   (B) the second derivatives of the splines are continuous at the interior data points
   (C) the first and the second derivatives of the splines are continuous at the interior data points
   (D) the third derivatives of the splines are continuous at the interior data points

3. The following incomplete y vs. x data is given.

x	1	2	4	6	7
y	5	11	????	????	32

The data is fit by quadratic spline interpolants given by

$$f(x) = ax - 1, \quad 1 \le x \le 2$$
$$f(x) = -2x^2 + 14x - 9, \quad 2 \le x \le 4$$
$$f(x) = bx^2 + cx + d, \quad 4 \le x \le 6$$
$$f(x) = 25x^2 - 303x + 928, \quad 6 \le x \le 7$$

where $a, b, c,$ and d are constants. The value of c is most nearly
   (A) -303.00
   (B) -144.50
   (C) 0.0000
   (D) 14.000

4. The following incomplete y vs. x data is given.

x	1	2	4	6	7
y	5	11	????	????	32

The data is fit by quadratic spline interpolants given by

$$f(x) = ax - 1, \quad 1 \le x \le 2,$$
$$f(x) = -2x^2 + 14x - 9, \quad 2 \le x \le 4$$
$$f(x) = bx^2 + cx + d, \quad 4 \le x \le 6$$
$$f(x) = ex^2 + fx + g, \quad 6 \le x \le 7$$

where a, b, c, d, e, f, and g are constants. The value of $\frac{df}{dx}$ at $x = 2.6$ most nearly is

(A) -144.50
(B) -4.0000
(C) 3.6000
(D) 12.200

5. The following incomplete y vs. x data is given.

x	1	2	4	6	7
y	5	11	????	????	32

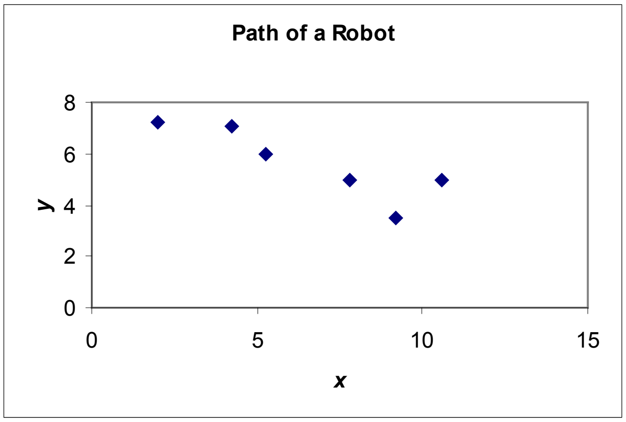
The data is fit by quadratic spline interpolants given by

$$f(x) = ax - 1, \quad 1 \le x \le 2,$$
$$f(x) = -2x^2 + 14x - 9, \quad 2 \le x \le 4$$
$$f(x) = bx^2 + cx + d, \quad 4 \le x \le 6$$
$$f(x) = 25x^2 - 303x + 928, \quad 6 \le x \le 7$$

where a, b, c, and d are constants. What is the value of $\int_{1.5}^{3.5} f(x)dx$?

(A) 23.500
(B) 25.667
(C) 25.750
(D) 28.000

6. A robot needs to follow a path that passes consecutively through six points as shown in the figure. To find the shortest path that is also smooth you would recommend which of the following?
   (A) Pass a fifth order polynomial through the data
   (B) Pass linear splines through the data
   (C) Pass quadratic splines through the data
   (D) Regress the data to a second order polynomial



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