

Multiple-Choice Test – Spline Method of Interpolation
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1. The following n data points, $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$, 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

$$f(x) = ax - 1, \quad 1 \leq x \leq 2$$

$$f(x) = -2x^2 + 14x - 9, \quad 2 \leq x \leq 4$$

$$f(x) = bx^2 + cx + d, \quad 4 \leq x \leq 6$$

$$f(x) = 25x^2 - 303x + 928, \quad 6 \leq x \leq 7$$

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

$$f(x) = ax - 1, \quad 1 \leq x \leq 2,$$

$$f(x) = -2x^2 + 14x - 9, \quad 2 \leq x \leq 4$$

$$f(x) = bx^2 + cx + d, \quad 4 \leq x \leq 6$$

$$f(x) = ex^2 + fx + g, \quad 6 \leq x \leq 7$$

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

$$f(x) = ax - 1, \quad 1 \leq x \leq 2,$$

$$f(x) = -2x^2 + 14x - 9, \quad 2 \leq x \leq 4$$

$$f(x) = bx^2 + cx + d, \quad 4 \leq x \leq 6$$

$$f(x) = 25x^2 - 303x + 928, \quad 6 \leq x \leq 7$$



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

