

Indian Institute of Technology Indore
MA204 Numerical Methods
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Tutorial Sheet 3

1. Find the natural cubic splines which interpolate the following dataset of (x, y) points: $(3.0, 2.5)$, $(4.5, 1.0)$, $(7.0, 2.5)$, $(9.0, 0.5)$; estimate the value for $x = 5$.
2. Find the interpolating cubic splines for the five logarithmic breakpoints $(1, \ln 1)$, $(2, \ln 2)$, $(3, \ln 3)$, $(4, \ln 4)$, and $(6, \ln 6)$.
3. Check whether $\mathcal{S}(x)$ is a spline of degree 2.

i.

$$\mathcal{S}(x) = \begin{cases} 0, & -1 \leq x \leq 0, \\ x^2, & 0 \leq x \leq 1. \end{cases}$$

ii.

$$\mathcal{S}(x) = \begin{cases} 0, & -1 \leq x \leq 0, \\ 1 - (x - 1)^2, & 0 \leq x \leq 1. \end{cases}$$

4. Calculate the natural cubic spline interpolating the data

$$\begin{array}{ccccc} x & 1 & 2 & 3 & 4 \\ y & 1 & \frac{1}{2} & \frac{1}{3} & \frac{1}{4}. \end{array}$$

5. Calculate the natural cubic spline interpolating the data

$$\begin{array}{ccccc} i & 0 & 1 & 2 & 3 \\ t_i & 0.9 & 1.3 & 1.9 & 2.1 \\ y_i & 1.3 & 1.5 & 1.85 & 2.1. \end{array}$$