

Assessment

Lagrange Polynomial Method of Interpolation

1. A unique polynomial of degree _____ passes through $n+1$ data points
 (A) $n+1$
 (B) n
 (C) n or less
 (D) $n+1$ or less.

2. Given the two points $[a, f(a)], [b, f(b)]$, the linear Lagrange polynomial $f_1(x)$ that passes through these two points is given by

(A) $f_1(x) = \frac{x-b}{a-b} f(a) + \frac{x-a}{a-b} f(b)$

(B) $f_1(x) = \frac{x}{b-a} f(a) + \frac{x}{b-a} f(b)$

(C) $f_1(x) = f(a) + \frac{f(b)-f(a)}{b-a}(b-a)$

(D) $f_1(x) = \frac{x-b}{a-b} f(a) + \frac{x-a}{b-a} f(b)$

3. The Lagrange polynomial that passes through 3 data points is given by

x	15	18	22
y	24	37	25

$$f_2(x) = L_0(x)(24) + L_1(x)(37) + L_2(x)(25)$$

The value of $L_1(x)$ at $x=16$ is

- (A) -0.07143
 (B) -0.5000
 (C) 0.57143
 (D) 4.333

ASSESSMENT – LAGRANGE POLYNOMIAL OF INTERPOLATION

4. The following data of velocity of a body is given as a function of time.

Time (s)	10	15	18	22	24
Velocity (m/s)	22	24	37	25	123

A quadratic Lagrange interpolant is found using three data points, $t=15$, 18 and 22. From this information, at what time is the velocity of the body 26 m/s during the time interval of $t=15$ to $t=22$ seconds.

- (A) 20.173s
- (B) 20.846s
- (C) 21.667s
- (D) 22.020s

5. A robot is following a path on a x - y plane is found by interpolating four data points as

X	2	4.5	5.5	7
Y	7.5	7.5	6	5

$$y(x) = 0.1524x^3 - 2.257x^2 + 9.605x - 3.900$$

The length of the path from $x = 2$ to $x = 7$ is

- (A) $\sqrt{(7.5-7.5)^2 + (4.5-2)^2} + \sqrt{(6-7.5)^2 + (5.5-4.5)^2} + \sqrt{(5-6)^2 + (7-5.5)^2}$
- (B) $\int_2^7 \sqrt{1 + (0.1524x^3 - 2.257x^2 + 9.605x - 3.900)^2} dx$
- (C) $\int_2^7 \sqrt{1 + (0.4572x^2 - 4.514x + 9.605)^2} dx$
- (D) $\int_2^7 (0.1524x^3 - 2.257x^2 + 9.605x - 3.900) dx$

6. The following data of the velocity of a body as a function of time is given

Time (s)	0	15	18	22	24
Velocity(m/s)	22	24	37	25	123

If you were going to use quadratic interpolation to find the value of the velocity at $t=14.9$ seconds, what three data points of time would you choose for interpolation?

- (A) 0, 15, 18
- (B) 15, 18, 22
- (C) 0, 15, 22
- (D) 0, 18, 24.

For answers, take the test online at

<http://numericalmethods.eng.usf.edu/mcquizzes/05inp/lagrange.html>