

Multiple-Choice Test – Lagrange Method of Interpolation
Autar Kaw

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 the 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 most nearly

- (A) -0.071430
- (B) 0.50000
- (C) 0.57143
- (D) 4.3333



4. The following data of the 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 of the times given in seconds is the velocity of the body 26 m/s during the time interval of $t = 15$ to $t = 22$ seconds.

- (A) 20.173
 (B) 21.858
 (C) 21.667
 (D) 22.020
5. The path that a robot is following 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

$$y(x) = 0.15238x^3 - 2.2571x^2 + 9.6048x - 3.9000$$

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) $\int_2^7 \sqrt{1 + (0.15238x^3 - 2.2571x^2 + 9.6048x - 3.9000)^2} dx$
 (C) $\int_2^7 \sqrt{1 + (0.45714x^2 - 4.5142x + 9.6048)^2} dx$



$$(D) \int_2^7 (0.15238x^3 - 2.2571x^2 + 9.6048x - 3.9000)dx$$

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

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

