

Lagrange Interpolation Polynomial

	0	1	2	3
X	5	6	9	11
F(x)	12	13	14	16

Find f(7)

😊 قانون الحل

$$\text{Lagrange} = L_0 + L_1 + L_2 + L_3$$

$$L_0 = f(x_0) * \frac{(x - x_1)(x - x_2)(x - x_3)}{(x_0 - x_1)(x_0 - x_2)(x_0 - x_3)}$$

$$L_1 = f(x_1) * \frac{(x - x_0)(x - x_2)(x - x_3)}{(x_1 - x_0)(x_1 - x_2)(x_1 - x_3)}$$

$$L_2 = f(x_2) * \frac{(x - x_0)(x - x_1)(x - x_3)}{(x_2 - x_0)(x_2 - x_1)(x_2 - x_3)}$$

$$L_3 = f(x_3) * \frac{(x - x_0)(x - x_1)(x - x_2)}{(x_3 - x_0)(x_3 - x_1)(x_3 - x_2)}$$

الحل:

قيمة x حسب القيمة المعطاة بالسؤال وهي 7

نعوض في المعادلات السابقة على حسب ما ورد في الجدول

$$L_0 = f(x_0) * \frac{(x - x_1)(x - x_2)(x - x_3)}{(x_0 - x_1)(x_0 - x_2)(x_0 - x_3)}$$

$$L_0 = 12 * \frac{(7 - 6)(7 - 9)(7 - 11)}{(5 - 6)(5 - 9)(5 - 11)}$$

$$L_0 = 12 * \frac{(1)(-2)(-4)}{(-1)(-4)(-6)}$$

$$L_0 = 12 * \frac{8}{-24}$$

$$L_0 = 12 * -0.33$$

$$L_0 = -4$$

.....

$$L_1 = f(x_1) * \frac{(x - x_0)(x - x_2)(x - x_3)}{(x_1 - x_0)(x_1 - x_2)(x_1 - x_3)}$$

$$L_1 = 13 * \frac{(7 - 5)(7 - 9)(7 - 11)}{(6 - 5)(6 - 9)(6 - 11)}$$

$$L_1 = 13 * \frac{(2)(-2)(-4)}{(1)(-3)(-5)}$$

$$L_1 = 13 * \frac{16}{15}$$

$$L_1 = 13 * 1.066$$

$$L_1 = 13.858$$

$$L_2 = f(x_2) * \frac{(x - x_0)(x - x_1)(x - x_3)}{(x_2 - x_0)(x_2 - x_1)(x_2 - x_3)}$$

$$L_2 = 14 * \frac{(7 - 5)(7 - 6)(7 - 11)}{(9 - 5)(9 - 6)(9 - 11)}$$

$$L_2 = 14 * \frac{(2)(1)(-4)}{(4)(3)(-2)}$$

$$L_2 = 14 * \frac{-8}{24}$$

$$L_2 = 14 * -0.33$$

$$L_2 = -4.66$$

$$L_3 = f(x_3) * \frac{(x - x_0)(x - x_1)(x - x_2)}{(x_3 - x_0)(x_3 - x_1)(x_3 - x_2)}$$

$$L_3 = 16 * \frac{(7 - 5)(7 - 6)(7 - 9)}{(11 - 5)(11 - 6)(11 - 9)}$$

$$L_3 = 16 * \frac{(2)(1)(-2)}{(6)(5)(2)}$$

$$L_3 = 16 * \frac{-4}{60}$$

$$L_3 = 16 * -0.066$$

$$L_3 = -1.066$$

$$\text{Lagrange} = L_0 + L_1 + L_2 + L_3$$

$$F(7) = (-4) + 13.858 + (-4.66) + (-1.066)$$

$$\text{Lagrange} = 4.132$$