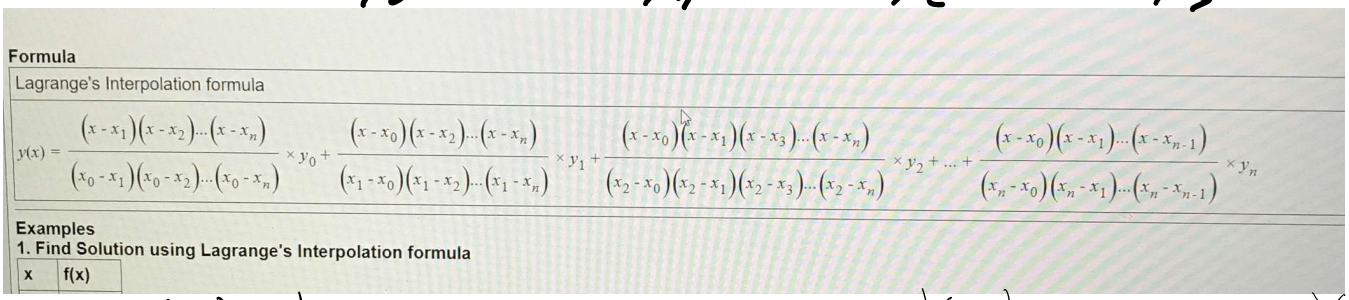
3) Find the distance moved by a particle and its acceleration at the end of 4 seconds, if the time verses velocity data is as follows: (Use Lagrange interpolation to generate the *v(t)* curve).

	X_0	X_1	X_2	X_3
t:	0	1	3	4
v:	21	15	12	10
	Y_0	Y_1	Y_2	Y_3



Formula

Lagrange's Interpolation formula

$$y(x) = \frac{(x-x_1)(x-x_2)\cdots(x-x_n)}{(x_0-x_1)(x_0-x_2)\cdots(x_0-x_n)} \times y_0 + \frac{(x-x_0)(x-x_2)\cdots(x-x_n)}{(x_1-x_0)(x_1-x_2)\cdots(x_1-x_n)} \times y_1 + \frac{(x-x_0)(x-x_1)(x-x_3)\cdots(x-x_n)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)\cdots(x_2-x_n)} \times y_2 + \ldots + \frac{(x-x_0)(x-x_1)\cdots(x-x_{n-1})}{(x_n-x_0)(x_n-x_1)\cdots(x_n-x_{n-1})} \times y_n$$

Examples

1. Find Solution using Lagrange's Interpolation formula

x	f(x)

$$v(t) = \frac{(t-1)(t-3)(t-4)}{(0-1)(0-3)(0-4)} \cdot 21 + \frac{(t-0)(t-3)(t-4)}{(1-0)(1-3)(1-4)} \cdot 15 + \frac{(t-0)(t-1)(t-4)}{(3-0)(3-1)(3-4)} \cdot 12 + \frac{(t-0)(t-1)(t-3)}{(4-0)(4-1)(4-3)} \cdot 10$$

FROM SIMPLIFICATION IN MATLAB:

$$v(t) = -\frac{5}{12}t^3 + \frac{19 \cdot t^2}{6} - \frac{35t}{4} + 21$$

$$a(t) = -\frac{5}{12} \cdot 3t^2 + \frac{19 \cdot 2t}{6} - \frac{35}{4}$$

$$X(t) = \int v(t) = -\frac{5}{12 \cdot 4}t^4 + \frac{19}{6 \cdot 3}t^3 - \frac{35}{4 \cdot 2}t^2 + 21t + X_0$$

$$X(4) = 54,8889$$

$$a(4) = -3,4167$$

SE MATCAB PLOT: