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$= 0.01x + 1.1x + 1.04 //$

2) Find a polynomial of degree four which takes the values $x = 2 \quad 4 \quad 6 \quad 8 \quad 10$
 $y = 0 \quad 0 \quad 1 \quad 0 \quad 0$

Sol: let us form the difference table.

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
2	0				
4	0	0	1		
6	1	1	-2	3	
8	0	-1	1	3	6
10	0	0			

let us find the polynomial using Newton's interpolation formula.

$$u = \frac{x-x_0}{h} = \frac{x-2}{2}$$
$$y(x) = y_0 + u \Delta y_0 + \frac{u(u-1)}{2} \Delta^2 y_0 + \frac{u(u-1)(u-2)}{3!} \Delta^3 y_0 + \dots$$
$$= 0 + u(0) + \frac{\left(\frac{x-2}{2}\right)\left(\frac{x-4}{2}\right)}{2} (1) + \frac{\left(\frac{x-2}{2}\right)\left(\frac{x-4}{2}\right)\left(\frac{x-6}{2}\right)}{6} (-3)$$
$$+ \frac{\left(\frac{x-2}{2}\right)\left(\frac{x-4}{2}\right)\left(\frac{x-6}{2}\right)\left(\frac{x-8}{2}\right)}{24}$$
$$= \frac{(x-2)(x-4)}{8} \left[1 - \frac{1}{2} \left(\frac{x-6}{2}\right) + \frac{1}{8} (x-6)(x-8) \right]$$
$$= \frac{1}{64} \left[(x-2)(x-4) \right] \left[8 - 4x + 24 + x^2 - 14x + 48 \right]$$
$$= \frac{1}{64} \left\{ (x-2)(x-4)(x-8)(x+10) \right\}$$
$$= \frac{1}{64} \left\{ x^4 - 24x^3 + 196x^2 - 624x + 640 \right\}$$



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5) From the data given below, find the number of students whose weight is between 60 & 70.

Weight:	0-40	40-60	60-80	80-100	100-120
No. of students:	250	120	100	70	50

Soln.

Diff. table

x	y	Δy	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
Below 40	250				
Below 60	370	120			
Below 80	470	100	-20		
Below 100	540	70	-30	10	
Below 120	590	50	-20		

Let us calculate the number of students whose weight is less than 70.

We will use forward difference formula,

$$u = \frac{x - x_0}{h} = \frac{70 - 40}{20} = 1.5$$

$$y(70) = y_0 + u\Delta y_0 + \frac{u(u-1)}{2}\Delta^2 y_0 + \dots$$

$$= 250 + (1.5)(120) + \frac{(1.5)(0.5)}{2}(-20)$$

$$+ \frac{(1.5)(0.5)(-0.5)}{6}(-10) + \frac{(1.5)(0.5)(-0.5)(-1.5)}{24}(10)$$

$$= 250 + 180 - 7.5 + 0.625 + 0.46875 \approx 424$$

No. of students whose weight is between 60 & 70
 $= y(70) - y(60) = 424 - 370 = 54 //$