2) Using Newton's backward difference formula, construct an interpolating polynomial of degree 3 for the data: f (– 0.75) = – 0.0718125, f (– 0.5) = – 0.02475, f (– 0.25) = 0.3349375, f (0) = 1.10100. Hence find f (– 1/3).

NEWTON BACKWARDS DIFFERENCE TABLE: (SAME WAY OF CALCULATING Δ AS FORWARD)

x	$f(x)$	Δf_i	$\Delta^2 f_i$	$\Delta^3 f_i$
-0,75	-0,0718125			
		0,0471		
-0,5	-0,02475		0,3126	
		0,3597		0,0938
-0,25	0,3349375		0,4064	
		0,7661		
0	1,10100			

Formula

Newton's Backward Difference formula ATOZMATH.COM

$$p = \frac{x - x_n}{h}$$

$$y(x) = y_n + p\nabla y_n + \frac{p(p+1)}{2!}\cdot\nabla^2 y_n + \frac{p(p+1)(p+2)}{3!}\cdot\nabla^3 y_n + \frac{p(p+1)(p+2)(p+3)}{4!}\cdot\nabla^4 y_n + \ldots$$

$p = \frac{(x-0)}{h} = \frac{x}{0,25}$ $\quad h = x_1 - x_0 = -0,5 - (-0,75) = 0,25$

$P_3(x) = 1,10100 + 0,7661\cdot p + 0,4064\cdot\frac{p(p+1)}{2!} + 0,0938\cdot\frac{p(p+1)(p+2)}{3!}$

$P_3\left(-\frac{1}{3}\right) = 0,1745$ SEE MATLAB PLOT: