

Example of Divided Differences

x	y	1 st diff	2 nd diff	3 rd diff
0	1	$\frac{23-1}{1-0} = 22$	$\frac{48-22}{2-0} = \frac{46}{2} = 13$	$\frac{-15-13}{4-0} = \frac{-28}{4} = -7$
1	23	$71-23 = 48$		
2	71	$\frac{77-71}{4-2} = \frac{6}{2} = 3$	$\frac{3-48}{4-1} = \frac{-45}{3} = -15$	
4	77			

$\therefore P_3(x) = 1 + 22x + 13x(x-1) + (-7)x(x-1)(x-2)$

graph of P_3 goes through (0,1), (1,23), (2,71) and (4,77)

Now, add a point

x	y	1 st	2 nd	3 rd	4 th
0	1	22			
1	23	48	13		
2	71	3	-15	-7	
4	77		$\frac{12-3}{4-2} = \frac{9}{2} = 4.5$	$\frac{-3-(-15)}{4-1} = \frac{12}{3} = 4$	$\frac{-6-(-7)}{4-0} = \frac{-1}{4} = -0.25$
-1	17	$\frac{17-77}{-1-4} = \frac{-60}{-5} = 12$			

$\therefore P_4(x) = P_3(x) - x(x-1)(x-2)(x-4)$
 graph of P_4 also goes through (-1,17).