

Example: Compute the divided differences with the following data

$x$	$f(x)$	I <sup>st</sup> DD	II <sup>nd</sup> DD	III <sup>rd</sup> DD
0	3			
1	4	1		
2	7	3	1	
4	19	6	1	0

## 2) Interpolating with divided differences

If we want to write the interpolating polynomial in the form

$$P_n(x) = a_0 + a_1(x-x_0) + a_2(x-x_0)(x-x_1) + \dots + a_n(x-x_0)(x-x_1)\dots(x-x_{n-1})$$

we saw that

$$a_0 = f(x_0) = f_0 = f[x_0]$$

$$a_1 = \frac{f(x_1) - f(x_0)}{x_1 - x_0} = f[x_0, x_1]$$

If we continue to compute we will get

$$a_k = f[x_0, x_1, \dots, x_k] \quad \forall k=0, 1, \dots, n$$

$\uparrow$   
 $k^{\text{th}}$  divided difference of  $f$   
 relative to  $x_0, \dots, x_k$