

Notice: 1) The IV DD of f are zero. That is because the IV DD approximates the fourth derivative of f so it is zero.

$$2) \text{ I}^{\text{st}} \text{ DD} = \frac{\text{I}^{\text{st}} \text{ difference}}{h} \quad (h=0.5)$$

$$\text{II}^{\text{nd}} \text{ DD} = \frac{\text{II}^{\text{nd}} \text{ difference}}{h(2h)} \quad (0.5 \text{ here})$$

$$\text{III}^{\text{rd}} \text{ DD} = \frac{\text{III}^{\text{rd}} \text{ difference}}{h(2h)(3h)} \quad (0.75 \text{ here})$$

An interpolating polynomial of degree n can be written in terms of the ordinary differences

$$P_n(x_0+sh) = P_n(s) = f(x_0) + s \Delta f(x_0) + \frac{s(s-1)}{2!} \Delta^2 f(x_0) + \frac{s(s-1)(s-2)}{3!} \Delta^3 f(x_0) + \dots + \frac{s(s-1)\dots(s-n+1)}{n!} \Delta^n f(x_0)$$

where $s = \frac{x-x_0}{h}$. This formula is called

Newton forward-difference formula.