Aumerical Differentiation Interpolation

Newton's forward interpolation formula

$$\frac{dy_0}{dx} = \frac{1}{h} \left[\begin{array}{c} \Delta y_0 + (2 h - 1) \Delta y_0 + (3 h^2 - 6 h + 2) \\ 2! \\ \Delta^3 y_0 + (4 h^3 - 18 h^2 + 22 h - 6) \Delta^4 y_0 \\ 3! \\ + \dots \end{array} \right]$$

> 1st Derivative for forward point

$$\frac{d^{2}y_{0}}{dx^{2}} = \frac{1}{h^{2}} \left[\frac{b^{2}y_{0} + (6\mu - 6)}{3!} \frac{b^{3}y_{0}}{3!} + (12\mu^{2} - 36\mu + \frac{1}{3!}) \right]$$

$$\frac{22}{4!} \frac{b^{2}y_{0}}{4!} + \cdots \right]$$

> 2nd Simative for forward point.

- Newton's backward difference formula

$$\frac{dy_{0}}{dx} = \frac{1}{h} \left[\nabla y_{0} + (2 + h + 1) \int y_{0} + (3 + h^{2} + 6 + h + 2) \right]$$

$$\frac{dy_{0}}{dx} + (4 + h^{2} + 18 + h^{2} + 22 + h^{2} + 6) \int \frac{d^{2}y_{0}}{4!}$$

$$\frac{dy_{0}}{dx} + (4 + h^{2} + 18 + h^{2} + 22 + h^{2} + 6) \int \frac{d^{2}y_{0}}{4!}$$

$$\frac{dy_{0}}{dx} + (4 + h^{2} + 18 + h^{2} + 22 + h^{2} + 6) \int \frac{d^{2}y_{0}}{4!}$$

> ist Derivative for backward fromt

$$\frac{d^{2}y_{0}}{dx^{2}} = \frac{1}{h^{2}} \left[\nabla^{2}y_{0} + (6p_{0} + 6) \nabla^{3}y_{0} + (12p_{0}^{2} + 36p_{0}^{2} + 36p_{$$

L> 2nd Derivative for backward point

Stirling's difference Formula

$$\frac{dy_{e}}{dx} = \frac{1}{h} \left[\frac{u8y_{o} + \mu8^{2}y_{o} + (3\mu^{2} - 1)u8^{3}y_{o}}{3!} + (4\mu^{3} - 2\mu)\frac{8^{4}y_{o}}{4!} + \cdots \right]$$

Los 1st Derivative for Studing point

$$\frac{d^{2}y_{0}}{dx^{2}} = \frac{1}{h^{2}} \left[8^{2}y_{0} + \frac{1}{h^{2}} \left(118^{3}y_{0} \right) + \left(12h^{2} - 2 \right) \right]$$

4 2 nd Derivative for Stirling point