NSM

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UNIT-II

♦ The Bisection Method

$$c = \frac{a+b}{2}$$

- Select "a"'s value such that f(a) is negative
- Select "b"'s value such that f(b) is positive

If

f(c) value is negative, a will be replaced with c and b will be same

f(c) value is positive, a will be same and b will be replaced with c.

The Newton-Raphson Method

$$x_{n+1} = x_n - \frac{f(x)}{f'(x)}$$

e.g. $x^2 - 2$, initially $x_0 = 1.0$ estimate x_1

$f'(x) = 2x$

$$x_{0+1} = x_0 - \frac{x^2 - 2}{2x}$$

$$= 1 - \frac{(-1)}{2} \Rightarrow 1 + \frac{1}{2} \Rightarrow 1.5$$

The Regula-falsi method

$$\frac{a\,f(b) - b\,f(a)}{f(b) - f(a)}$$

~~a = xn~~ "a" and "b" will be given in the question

The Secant Method.

$$x_{n+1} = \frac{(x_n - 1)\,f(x_n) - x_n\,f(x_n - 1)}{f(x_n) - f(x_n - 1)}$$

eg. $f(x) = x^3 - 2x - 5$ $\quad x_n = 1$; $x_n = 2$

way to type in calculator ↓ $\quad f(x_n) = y \quad (x_n - 1) = x$

$$x_{n+1} = \left(\frac{x\,(y^3 - 2y - 5) - y(x^3 - 2x - 5)}{(y^3 - 2y - 5) - (x^3 - 2x - 5)}\right)$$

- Newton's Forward Method (Vecche wla - Upor wla)

$$y = y_0 + p\Delta y_0 + \frac{p(p-1)\Delta^2 y_0}{2!} + \frac{p(p-1)(p-2)\Delta^3 y_0}{3!} + \dots\dots$$

- Newton's backward Method (Upor wla - Vecche wla)

$$y = y_n + p\nabla y_n + \frac{p(p-1)\nabla^2 y_n}{2!} + \frac{p(p-1)(p-2)\nabla^3 y_n}{3!} + \dots\dots$$

- Lagrange Interpolation

$$y = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} \times y_0 + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} \times y_1$$

$$+ \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} \times y_2 + \dots\dots$$