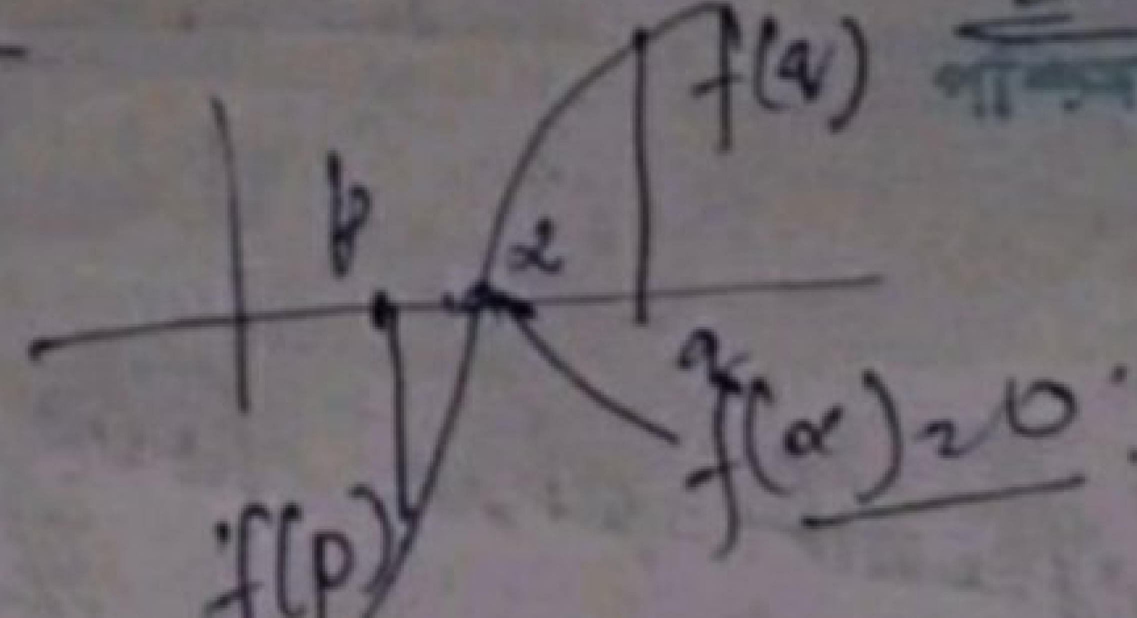
13/3/2020 Algebraic Eq^n - Eq^n containing polynomial terms.

Transcendental Equation :-



Saha Roy, Srivastava

Numerical analysis with algorithm & programming

$x_n \to \alpha$ as $n \to \infty$

$h_n = x_{n+1} - x_n = \mathcal{E}_n - \mathcal{E}_{n+1}$

$f(a)f(p) < 0$

$f(a)f(p) > 0 \to$ either no root or even no. of roots

$y = x = \sin x$.

2.3 Initial App.

2.3.1 Graphical Method

Example 2.1

Example 2.2

Example 2.6.

✓ $f(x) = x^3 + x + 1 = 0$

✓ Table 2.8.

2.4 Iterative Method

Theorem 2.2 Bolzano Method.

2.4.3 Fixed point Iteration

2.4.3.1 Condition of Convergence for fixed-Point Iteration Method

2.44 NR Method

Initial guess

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \quad (2.21) \qquad f(x_0) \neq 0$$

বর্ষ্যালাভ শিক নতুর

2.4.4.2 Order of Convergence for NR Method ..

↳ 2 ॥.

Table 2.14 → Problem ॥

Santanu Saha Ray

25.09.2020
Uttam Ghosh

1.3 {Approx. Method and Significant figure}

1.3 Numerical Analysis

i) Absolute error $|x_T - x_A|$

Relative Error = $\frac{|x_T - x_A|}{(x_T)}$

ii) Since, the another three types of error are –

i) Inherent Error ii) Truncation Error

iii) Rounding off Error.

1.4 Rounding Off

1.4.3 Inherent Error

2.4.3 Fixed Point Iteration

$f(x) = 0$

Example 2.6

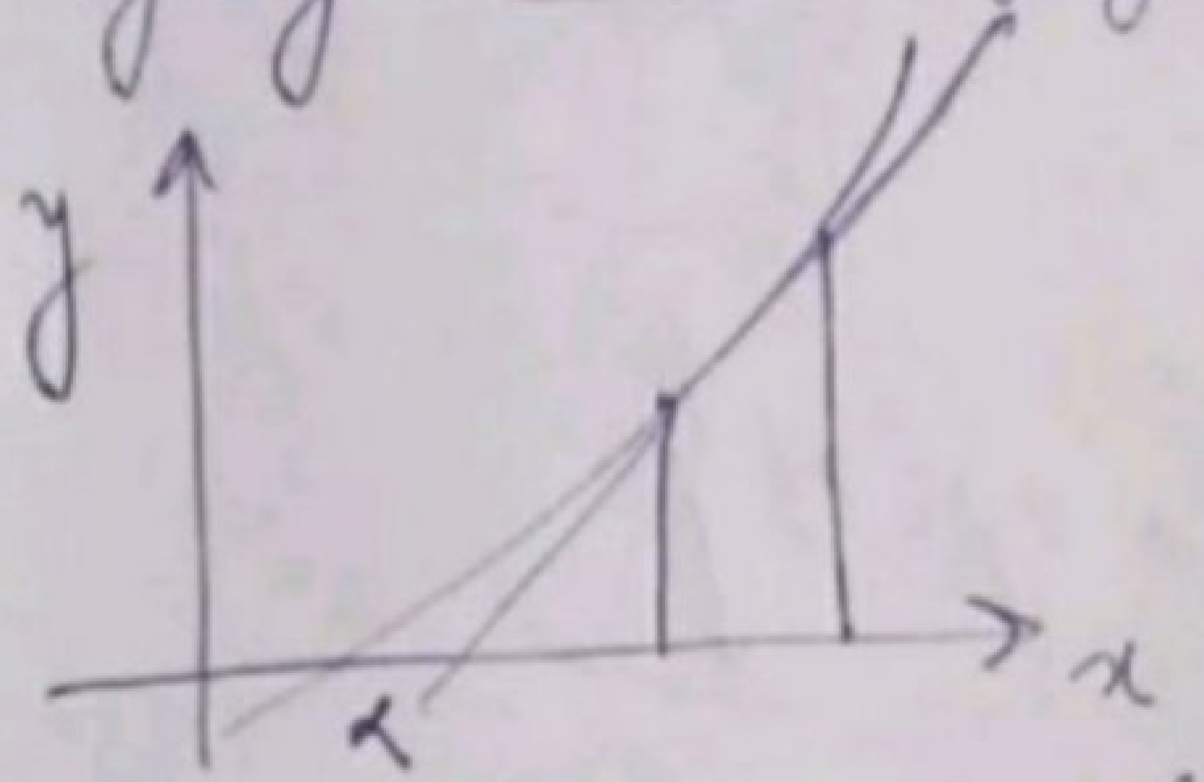
2.4.4. → Newton Raphson Method

Equation 2.21

Condition of Convergence.

8-12-2020

Geometrical Significance of NR



2.4.4.4 Advantages & Disadvantages of N-R Method

Eg. 2.9 $10^x + x - 4 = 0$.

Here the root is 0.539179l

Eg:- 2.10 $x^2 - 10\log_{10}x - 3$

"Bokrolekha"??
"Dhubak"

2.4.5 Secant Method (Not in Syllabus).

2.4.5.2 Order of Convergence for the Secant Method.

2.5 Generalized Newton Method (Modified)

পশুপতিনাথ সরকার

$$f(x) = (x-\alpha)^r g(x) \; ; \; g(\alpha) \neq 0$$

$$\phi(x) = x - r\frac{f(x)}{f'(x)} \; ; \text{ such that } \phi'(\alpha) \neq 0$$

$$f(x) \rightarrow (x-\alpha)^r g(x)$$

$$f'(x) \rightarrow (x-\alpha)^{r-1}\{(x-\alpha)g'(x) + r g(x)\}$$

$$\frac{f(x)}{f'(x)} = (x-\alpha)\phi_1(x)$$

2.5.1.1 Newton's Method

Let (x_0, y_0) be an initial approx. of roots

On Taylor Expansion,

$f(x_0, y_0) + \left(\Delta x \frac{\partial}{\partial x} + \right.$ - - -

$g(x_0, y_0)$ - -

Numerical

6.4.1 Guass Jacobi

6.4.1.1 Convergence

Example 6.9

6.4.2 Guass Seidel

Example 6.1.1

Book -Santanu

9:16 pm

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Maths

UCS 08-01-2020

Proptieis

1. $K_i^{(n)} = K_{n-i}^{(n)}$

5.3.1 Deduction of Trapezoidal, Simpson's One-Third, + 174

Weddle's and

Pg-195. $\int_a^b f(x)\,dx = (b-a)$

Pg-197

Richardson Extrapolation → 5.6

Uttam Sir

Gauss Elimination Method

পরিমল সরকার

Numerical Methods for Scientific and Engineering Computation

$[A|b] \xrightarrow[\text{Elimination}]{\text{Gauss}} [U|c]$

Pg-114

Partial Pivoting

zuo-hkxz-xdg

Example 3.5

Uttam Sir

$10x_1 - x_2 + 2x_3 = 4$

zuo-hkxz-xdg

Ex 3.7 $x_1 + x_2 + x_3 = 6$

5 (Numerical Integration with Algorithms and Programming)

5.1 $\int_a^b f(a)$

$\int_0^{\sqrt{\pi/2}} \sin^2(x)\,dx \to$ not differential / Integrable } etc.

Integrable function → Primitive funcⁿ

$f(x) = \phi'(x)$

$\boxed{f(x) = \phi'(x)}$ $\phi(x)$ is called Primitive function

(a) Only some functions can be integrated

$\sin^2(x) \to$ Interpolate to a polynomial

$$f(x) = \varphi_n(x) + \Pi(x)\frac{f^{(n+1)}(\xi)}{(n+1)!}$$, where $a < \xi < b$.

$$f(x) = \sum_{i=0}$$

$$\Pi(x) = (x-x_0)\cdots(x-x_n)$$

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5.2 Numerical Integration from Lagrange's Interpolation

$$R_{n+1}(f) = \int_a^b \frac{\pi(x)}{(n+1)!}\, dx.$$

বাগান শিক্ষা বস্ত্র

$\pi(x) = (x-x_0)\cdots(x-x$

Defination 5.2 : Degree of Precession

5.3 Newton-Cotes formula for Numerical Intergoation

$$f(x) = \sum_{i=0}^{n} \frac{\pi(x)}{(x-x_i)\pi'(x_i)} y_i + \frac{\pi(x) f^{(n+1)}(\xi)}{(n+1)!}$$

and $\int_a^b f(x)\,dx = \sum_{i=0}^{n} H_i^{(n)} y_i + R_n(f)$.

where $H_i^{(n)}$ and $R_{n+1}(f)$ are -

5.3

5.6

5.7

5.8

$$\int_a^b f(x)\,dx = \sum_{i=0}^{n} H_i^{(n)} y_i + R_{n+1}(f)$$
$$= (b-a)\sum_{i=0}^{n} K_i^{(n)} y_i + R_{n+1}(f). \quad 5.9$$

Eq. 5.8

(8) $\sum_{i=0}$ (1.34)

লক্ষ্মীনারায়ণ সরকার

(5.21) $R_2(f) = \int_0^b f(x)dx = \frac{h}{2}($

5.24

$I = I_T\left(\frac{h}{2}\right) + c_1\left(\frac{h^2}{4}\right) + c_2\frac{h^4}{16} + c_3\left(\frac{h^6}{64}\right) + \ldots$ — 5.34

$I =$ (5.76) → fourth Order Error Term

Replacing h by (h/2) in Eq. 5.76

Example 5.5. Pg 228

$I = I_T\left(\frac{h}{2}\right)$.

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15.01.2020

Pg - 229

$$I = \int_{-a}^{b} w(x)\,y\,dx = \int_{-a}^{b} w(x) f(x)\,dx \quad \text{---} \quad (5.85)$$

$w(x) > 0 \quad (a \le x \le b)$ the weight function

$$x = \left[(b-a)/2\right]u + \left[(b+a)/2\right]$$

$$y = f(x) = f\left(\frac{b-a}{2}u + \frac{b+a}{2}\right) = \phi(u)$$

$$w(x) = w\left(\frac{b-a}{2}u + \frac{b+a}{2}\right) = \psi(u)$$

$$w_1 \phi(u_1) + w_2 \phi($$

~~5.8.1 Gauss-Legendre Integration Method~~

Pg 231

5.8.1 Gauss Legendre Integration Method

$$\int_a^b f(x)\,dx \cong (b-a) f\left(\frac{a+b}{2}\right) \quad - \underline{5.94}$$

5.9 Gaussian Quadrature

Theorem 5.3 :-

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2.1, 2.2, 2.3, 2.4.3, 2.4.3.1, 2.4.4, 2.4.4.1, 2.4.4.2

2.4.4.3, 2.4.4.4, 2.4.5, 2.4.5.1, 2.4.5.2, 2.4.5.3, 2.5

2.5.1, Gauss elimination.

6.4.1, 6.4.1.1, 6.4.2

5.2, 5.3, 5.7, 5.8, 5.9