Book: An Introductory method of Ward

methoids of solution

(i) Analytical

(ii) Graphical

(iii) Numerical

C ampanison

Numerical methods:

Numerical methods are techniques by which mathermatical problems are formulated so that they can be solved with anithmetic openations.

Non computer methods:

Analytical Vs. Numerical methods

Need for Numerical Methods:

Reasons to Study numerical Analysis

Mathematical Modelings of model

Complex mathematical model

Analytical Solution to Newton's Second Law

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Campanison between	n Analytical us Numerical solution
la inflomition  Instignation  Lossing with 17:	when the stand would
05Sep, 18	Class:
Approximate Approximate	ions and Empores maldong in them
Computer	based Solutions
	Hon computer methods:
A courage	and precision

Accuracy: Accuracy is neloted to the closeness to

Precision: Precision is helated to the closeness to other estimated values.

Bias: Bias mefens to systematic deviation of value.

Significant Figures
Rules for identifying sig. figures: xong
the state of the s
Scientific notation:
Gelennigie morecino.
Why measure ennous?
· To determine the accuracy of numerical results
to determine the accuracy of numerical results
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## Thue Ennon (Et)

Approximate Ennon

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Root finding problems

Class:

Given a continuous function for

find the value to such that f (n) = 0

These problems are called noot finding problems

A mumber n that satisfies an equation is

called a noot of the equation.

The equation: 2-323-724152 =-18

Zenos of a Function

Graphical Interpretation of Feros

Simple Zenos taxing range Muttiple Denos Solution Methods Several ways to solve, nonlinear equations are possible. · Analytical Solutions · Graphical Solutions solvenies tornothis son · Numerical Solutions Bracketing methods

reitoreis with the support of t Numerical Iterative Methods to boxtom

Iterative Methods (continued) anvert

- Bracketing methods (Interpolation methods)
- Open end methods (Extrapolation methods)

Stanting on itenative process Search bracket Solution Methods Bisection Method

SND 2001+DUPS NOOMITMENT SVIDE of RIEDW Intermediate Value Theorem stolices of have different signs then Bisection Method znottulo dosing woll. If the function is continuous on [a,b] and fcaj and f(b) have different signs. Bisection Method obtaining Mithable bolysmull Assumptions writing) about M suitougt - Brock-time methods (that explains methods) Open and matiliands (Extrapolation methors)

Blsection Algorithm Flow Chant of Bisection Method Bisectional Method's Example 1 Find the noot of the equation: 23+42-1=0 Solution! C Stimote @ Let,  $\alpha=0$ , and b=1f(0) = (0)3 + 4(0) - 1 = -1 20 and f(1) = (1)3+0 4(1) -1=450 i.e f(a) and flb) has opposite signs. CAUATION X = COS(OL) WITH appoint CIDED (0.02 [ Assume the mitial interval [0.5:0.9] [ (M) 2 21 - LONU! : 250) (18: How worm identions eatisfied 9

10, 50

81 p-2

Marchlan Malarally Best Estimate and Ennon Level

both of mothered in two. I won! Questions.

What is the best estimate of the seno of What is the ennon level in the obtained estimate 9 1 = d bmb . n = 12 . + 1

Stopping Culteria

Convengence Analysis

Example
Exp: Use Bisection method to find a noot of the equation x = cos(x) with absolute ennon 20.02 (Assume the mitial interval [0.5, 0.9])

Q1: What is f(m)?

Q2: Are the assumptions satisfied?

Q3: How many itenation are needed?

Q4: How to compute the

Bisection Method summer and mother in the yours Advantages; Simple and easy to implement One function evaluation per i-tenation : books M molhod: 1 took sources from each skill on motherinizonges frontidus final I will converge to the actual boost of spring ti iller mand on Proposiphore instal 1000 Mar flows money of (ab) } who Disadvantage: ne = f(11) Slow to coverage, Good intermidiate approximation may be discarded

## Iteration Method Suppose we have an equation in the form g(x)=0 Rewnide the equation in the form red(x). Simple and easy to implement thod: Convergence Conditions Iteration Method: Any antitrony approximation 20,21,2 does not assure that It will convenge to the actual most of the equation ns= f(20) n2 = f(n1) opproxib and from mother disconded

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Itenation Method: Example Solves 12 = 2+ sin(x)/2/inot gelot to boot M sol tind the real most of the equations its sold with a second loiting our esquipsion Iteration Method: Drawbacks We need an approximate mittal quesses no. It is also a slower method to find the hoot ind the beat noot of the equation fill 2 decimal place. - (101) = x3-20c-5 = 0 observe that f(2) = -1 and f(3). It Whom-Ropson Method Method Memoral aled Theory of the contract

Class:05 The Method of False Position on Regula Falsi Like the bisection method, Method of False Position bequires two initial guesses ha and xb such that

chation Method : Brandorks The Method of False & Position: Gréometric Significance.

. From the hait of hastern would a neto ei hi Ex! Find the head most of the equation till 2 decimal place.

$$f(n) = x^3 - 2n - 5 = 0$$

We observe that f(2) = -1 and f(3) = 16And hence a root lies between 2 and 3. Then,

Newton-Rapson Method

Iterative Method: Drowbacks

Convengence Criteria of Iteration Method

Acceleration of Convengence: Aitken's A Process

Explain the acceleration method, how can comprocess to

Class test: Approximation evenon, root and finding method upto newton napson

den to see a late

A hobbems:

Example 2.7

Chap! 1

Numerical method of a Carcursaluar.

Balagunswams - Numerial method (Ennon)

Taxonomy of ernons

· I care it was the Newton-Rapsan Method: Dnawbacks

The Newton-Rapson method hequires the calculation of the derivative.

Generalized Newton's Method

$$\lambda_{n+1} = \lambda_n - p \frac{f(n)}{f'(n)}$$

$$f(n) = n^{2} - n^{2} + n + 1$$

$$P = 3$$

$$f'(n) = 8n^{2} - 2n + 1$$

$$P = 2, (P-1)$$

$$f''(n) = 6n - 2$$

$$P = 1, (P-2)$$

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N . 1. ( . ) . .

Find a double hoof of the equation. f(x) = 2-2-2-1-1=6 Hene, flag = 32 - 22 -1, and f (a) = 62-2 with 20=0.8 we obtain 10-2 f(no) = 0.8-2 6.072 = 1.012 and  $n_0 - \frac{f'(n_0)}{f''(n_0)} = 0.8 - (-\frac{6.68}{2.8}) = 1.043$ 

Secont Method:

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$$\chi_{i+1} = \chi_i - \frac{\int (\chi_i) - \int (\chi_{i-1})}{\int (\chi_{i-1}) - \int (\chi_{i-1})} = \chi_i - \int (\chi_i) - \int (\chi_{i-1})$$

$$\frac{\int (\chi_i) - \int (\chi_{i-1})}{(\chi_i) - \chi_{i-1}}$$

Greometrical representation of the secont method

Denivation of Secont Method & son

Apply Secont Method in the floating point problem!  $f(x) = x^2 - 0.165 x^2 + 3.993 \times 10^{-4}$ 

Let Tus assume the initial guesses of the hoot of f(n) = 0 as  $n_1 = 0.02$  and  $n_0 = 0.05$ 

Secont method:

Floating ball problem

Iteration 3 for the floating ball problem (secont

2 = 0.06238

The absolu

Flow Chant of Secont's Method:

Advantages of Secont Method!

1. It converges at fasten than a limean nate,

2

Disadvantage of Secont Method:

1.

2.

Next: Interpulation