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CL249 : ASSIGNMENT 5

Problem

We are given a data set of X's and Y's and we have to fit an eight degree polynomial ~~on~~ and find difference between sqrt(x) and calculated polynomial on given values, and plot the values and the function.

Description of Method

We are given discrete x and y eg. x_0, y_0, x_1, y_1, etc. and we know that by the polynomial.

$$y_0 = a_0 + a_1 x_0 + a_2 x_0^2 + \cdots + a_n x_0^n \qquad \text{here } n=8$$

$$y_1 = a_0 + a_1 x_1 + a_2 x_1^2 + \cdots + a_n x_1^n$$

$$\vdots$$

$$y_n = a_0 + a_1 x_n^1 + \cdots + a_n x_n^n$$

So. it can be represented as a matrix eq.

$$\begin{bmatrix} 1 & x_0 & x_0^2 & x_0^3 & \cdots & x_0^n \\ 1 & x_1 & x_1^2 & x_1^3 & & \vdots \\ 1 & x_2 & \vdots & & \ddots & \vdots \\ \vdots & \vdots & \vdots & \cdots & \ddots & \\ 1 & x_n & x_n^2 & x_n^3 & & x_n^n \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ \vdots \\ a_n \end{bmatrix} = \begin{bmatrix} y_0 \\ y_1 \\ \vdots \\ y_n \end{bmatrix}$$

$$A \cdot X = B$$

and we can solve this by Gauss Elimination.

and by finding the coeff., we get the polynomial.

Pseudo Code

main

load X and Y
and descrete values
calculate matrices A and B.
~~Solve AX = B. as~~
get X = $A^{-1}B$
X : gauss_elim(A, B)
define function f(x) from coefficients
decalre difference matrix
loop from 1 : length(diff)
→ difference = |f(x) - sqrt(x)|
get descrete values X
y = f(x)
plot x and y