

Open Methods

Problem Set 2

September 26, 2019

1 Problem

Estimate root of a polynomial $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$ using **Newton-Raphson** and **Secant** method. Stop iterations if ϵ_a becomes less than ϵ_s or *maxitr* no. of iterations have already been completed. You can find the algorithms to implement the methods in this slide.

2 Input

You have to take input from a file.

Input for Newton-Raphson Method

The input file will consist of $3 + 1 + (n + 1)$ lines. The first 3 lines will contain $x_i, \epsilon_s, \text{maxitr}$ respectively. Next line will contain the value of n . The next $(n+1)$ lines will contain the coefficients.

Input for Secant Method

The input file will consist of $4 + 1 + (n + 1)$ lines. The first 4 lines will contain $x_{i-1}, x_i, \epsilon_s, \text{maxitr}$ respectively. Next line will contain the value of n . The next $(n + 1)$ lines will contain the coefficients.

3 Output

Output of your program will consist of two parts:

Console Output

For **Newton-Raphson** method you have to print the iteration number, x_i, x_{i+1}, ϵ_a for each iteration. Finally you have to print the final estimated root.

For **Secant** method you have to print the iteration number, $x_{i-1}, x_i, x_{i+1}, \epsilon_a$ for each iteration. Finally you have to print the final estimated root.

File Output

For **Newton-Raphson** method you have to print the iteration number, x_i , x_{i+1} , ϵ_a for each iteration. Finally you have to print the final estimated root.

For **Secant** method you have to print the iteration number, x_{i-1} , x_i , x_{i+1} , ϵ_a for each iteration. Finally you have to print the final estimated root.

4 Sample Input-Output

Input

Sample input file for Newton-Raphson Method [click here](#)

Sample input file for Secant Method [click here](#)

Output

Generated Output file for Newton-Raphson Method [click here](#)

Generated Output file for Secant Method [click here](#)

5 Hints

Add a function named *derivative_function(x)* which will return the derivative of the function f at x to your previous code.

6 Important Notes

- Implement using Python programming language
- Be careful about floating point arithmetic

7 Marks Distribution

- Newton-Raphson Method: 6
- Secant Method: 6
- Input from File: 3
- Console Output: 3
- File Output: 2

8 Rules

- You have to submit your code (only .py file) through the submission link provided in the site. The file name will be in the following format:

`<Your_10_Digit_Student_ID>.py`

For example, the submitted file name would look like 2016-2-60-108.py if it is submitted by a student having 2016-2-60-108 as student id.

- Any type of plagiarism is strongly forbidden. **NO** marks will be given to the students who will be found to be involved in plagiarism (from internet/senior/class- mates code etc.). It does not matter who is the server and who is the client.

9 Deadline

Deadline is set at 8 October, 2019 8:00 am. (The date might prepone or postpone 3 – 4 days)