ESO208: Computer Assignment - 1

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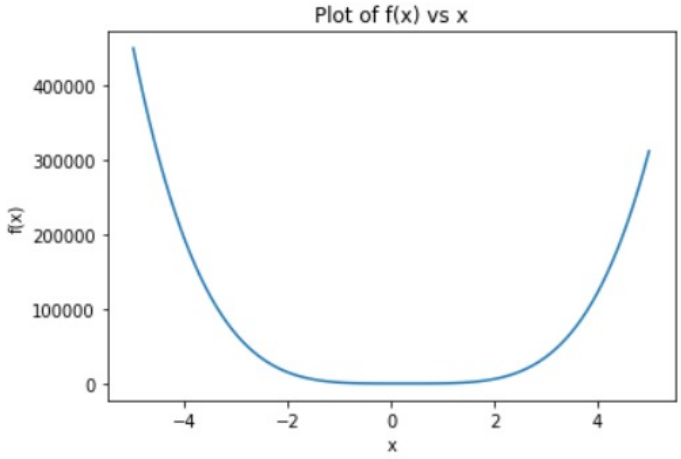
29 August 2021

Question 1

Test Input 1

$$f(x) : 600x^4 - 550x^3 + 200x^2 - 20x - 1$$

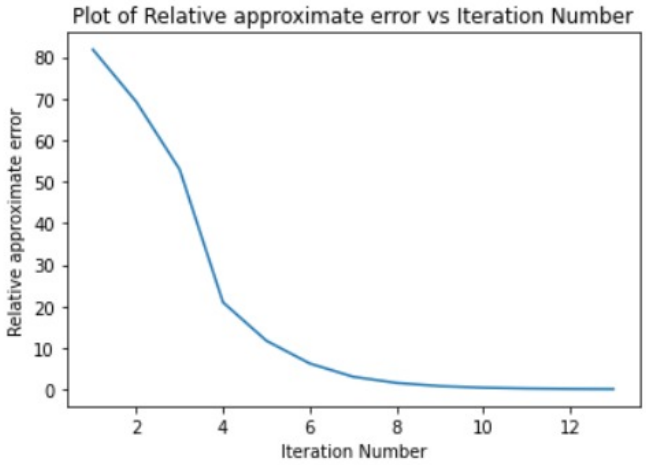


Bisection Method

$$Starting\ Points : x_l = 0.1, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



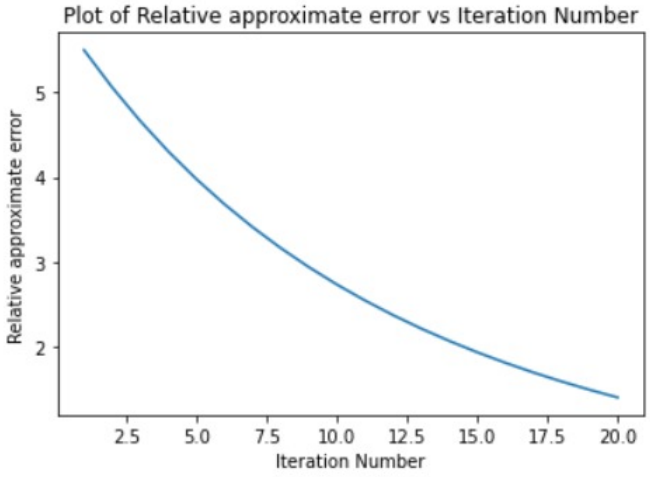
Output: Approximate solution of the equation is 0.23238525390625003

False Position Method

$$Starting\ Points : x_l = 0.1, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



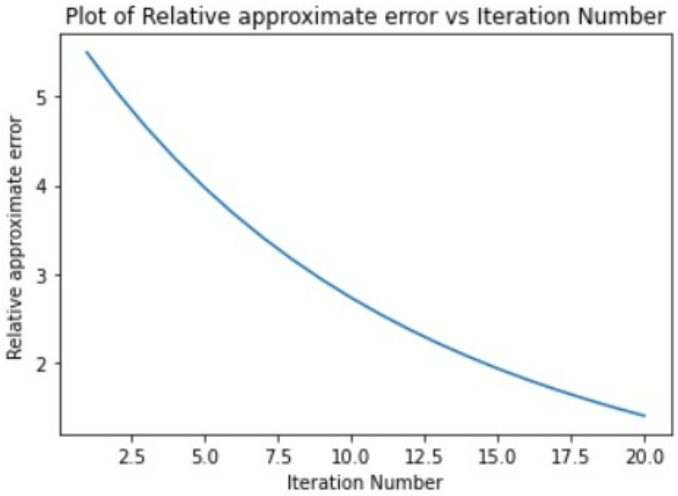
Output: Approximate solution of the equation is 0.18146019007286995

Modified False Position Method

$$Starting\ Points : x_l = 0.1, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



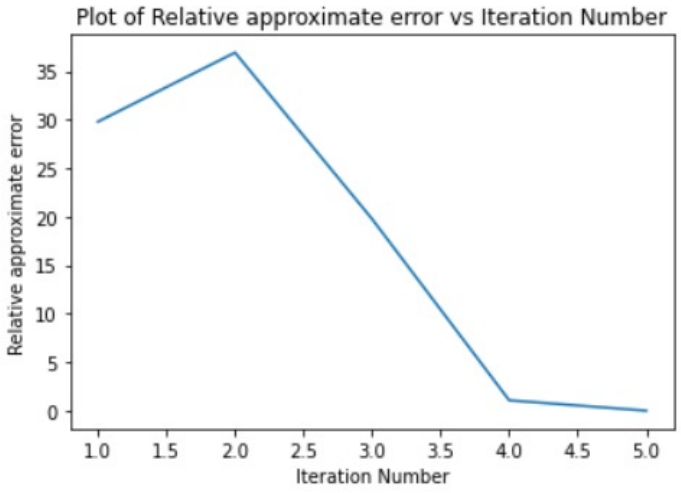
Output: Approximate solution of the equation is 0.18146019007286995

Newton Raphson Method

$$Starting\ Point : x_0 = 0.5$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



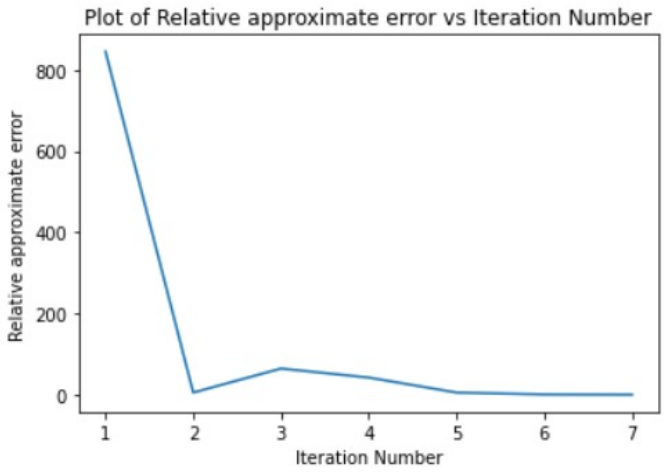
Output: Approximate solution of the equation is 0.23235296476876374

Secant Method

$Starting\ Points : x_{-1} = 0.1, x_0 = 1.0$

$Maximum\ Iterations : 20$

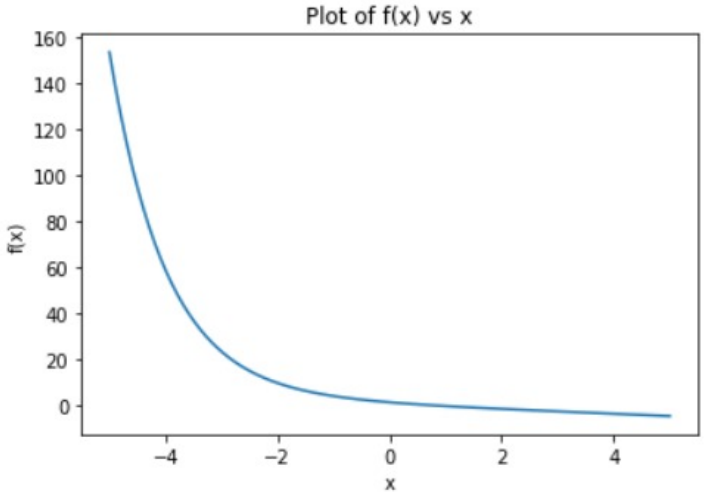
$Maximum\ relative\ approximate\ error : 0.05\%$



Output: Approximate solution of the equation is 0.23235295673399128

Test Input 2

$$f(x) : e^{-x} - x$$

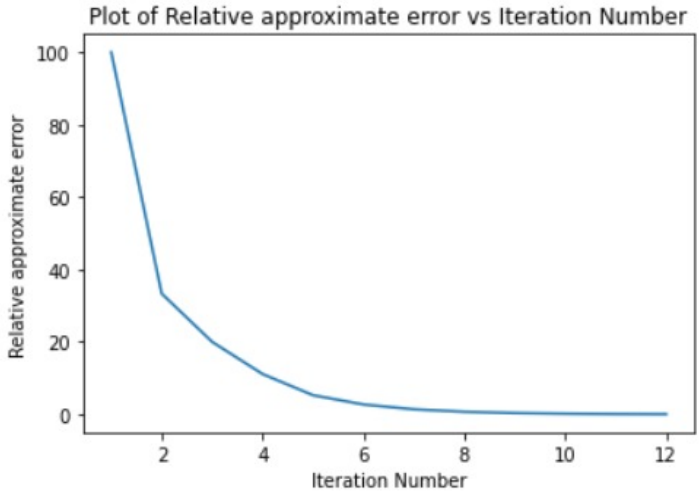


Bisection Method

$$Starting\ Points : x_l = 0.0, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



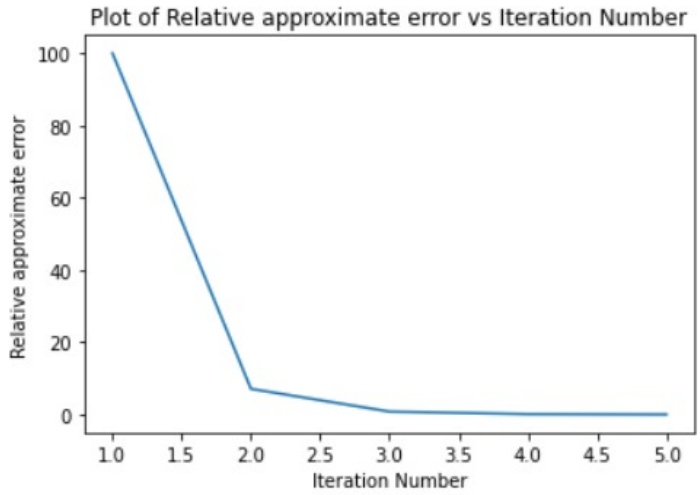
Output: Approximate solution of the equation is 0.567138671875

False Position Method

$$Starting\ Points : x_l = 0.0, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



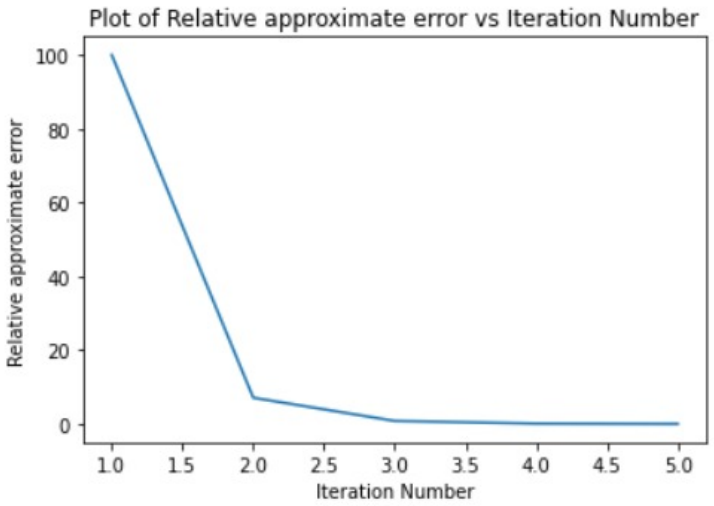
Output: Approximate solution of the equation is 0.567150214240495

Modified False Position Method

$$Starting\ Points : x_l = 0.0, x_u = 1.0$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



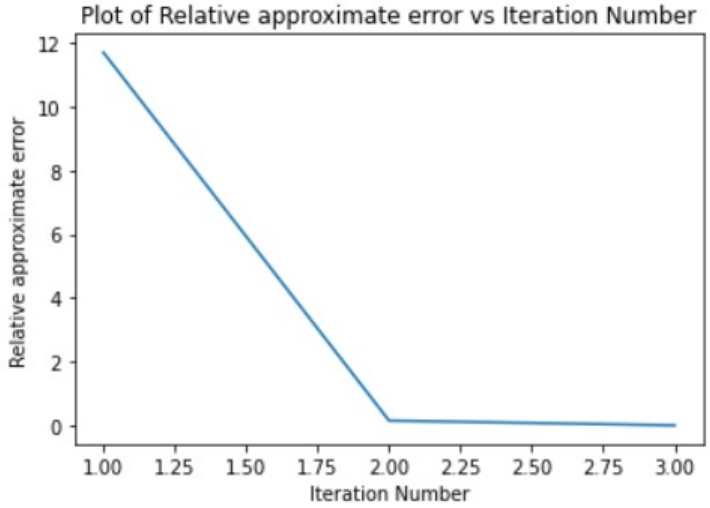
Output: Approximate solution of the equation is 0.567150214240495

Newton Raphson Method

$$Starting\ Point : x_0 = 0.5$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$



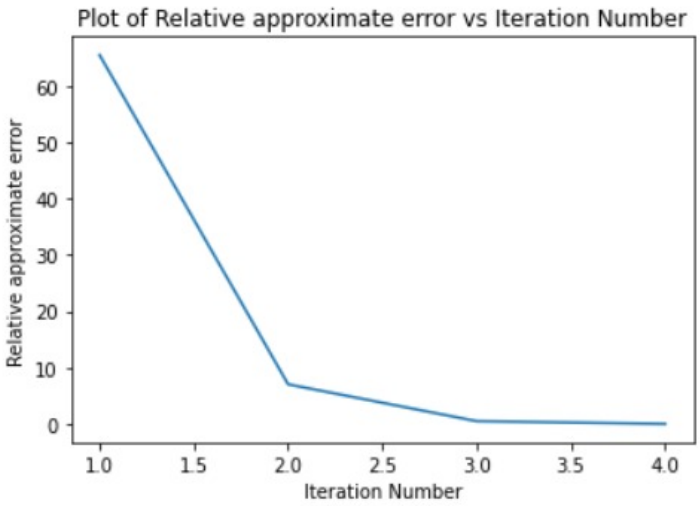
Output: Approximate solution of the equation is 0.567143290409781

Secant Method

$Starting\ Points : x_{-1} = 0.1, x_0 = 1.0$

$Maximum\ Iterations : 20$

$Maximum\ relative\ approximate\ error : 0.05\%$

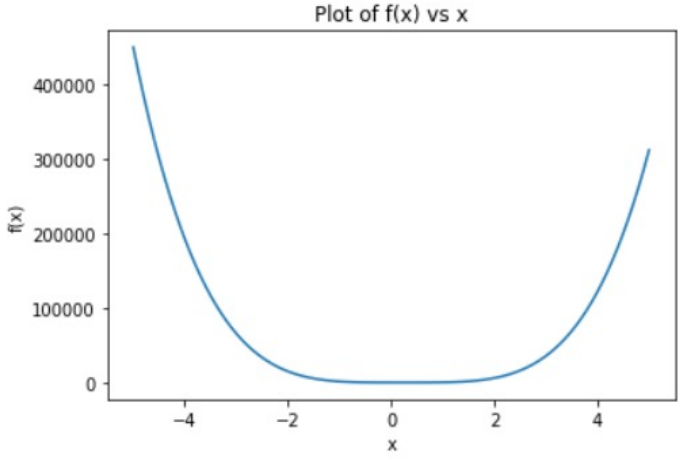


Output: Approximate solution of the equation is 0.5671432990837618

Question 2

Test Input 1

$$f(x) : 600x^4 - 550x^3 + 200x^2 - 20x - 1$$



Muller's Method

$$Starting\ Points : x_0 = 0, x_1 = 0.1, x_2 = 0.3$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$

Output: Approximate solution of the equation is 0.23235296476091424

Bairstow's Method

$$Starting\ Points : r = -1, s = -1$$

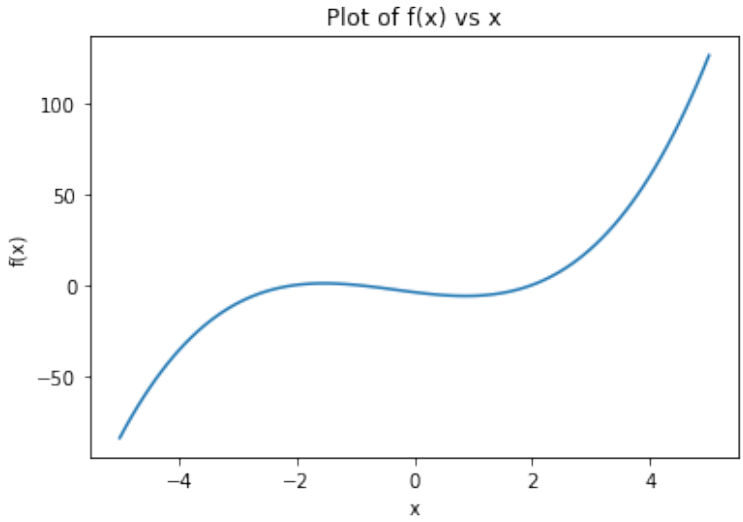
$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$

Output: The roots (both complex and real) are:
(0.1750883714381913+0.2581923060951063j)
(0.1750883714381913-0.2581923060951063j)
0.2323529647491251
-0.035839691866268036

Test Input 2

$$f(x) : x^3 + x^2 - 4x - 4$$



Muller's Method

$$Starting\ Points : x_0 = 0, x_1 = 0.5, x_2 = 1$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$

Output: Approximate solution of the equation is 2.0000000000535696

Bairstow's Method

$$Starting\ Points : r = -1, s = -1$$

$$Maximum\ Iterations : 20$$

$$Maximum\ relative\ approximate\ error : 0.05\%$$

Output: The roots (both complex and real) are:
-1.0000000000000067
-1.9999999999999112
1.9999995594123512