

Assignment 2

The objective of this assignment is to implement and solve non-linear equations using four numerical methods: the Bisection method, Newton-Raphson method, Secant method, and Fixed-Point Iteration method. You will write Python code to implement each method and apply it to solve all of the given non-linear equations:

1. Non-Linear Equations

Non-Linear Equations	Bisection	Newton-Raphson	Secant	Fixed-Point Iteration
$e^{-x} - x = 0$	0.57	0.567	0.56	0.56 0.56 -2.45
$x^3 - x - 2 = 0$	2.52	1.521	2.52	0.73
$\cos(x) - x = 0$	0.74	0.73	0.73	-2.04
$x^3 - 2x^2 + 4 = 0$	-1.12	-1.13	-1.13	

2. Use Newton-Raphson method and Fixed-Point Iteration method to solve the following multivariate coupled equations:

Non-Linear Equations	Newton-Raphson	Fixed-Point Iteration
$x^2 + y^2 = 5$ & $xy = 2$	(2, 0.99)	(2.00, 1.00)
No. of iterations	4	2

- Submit a Python script or Jupyter Notebook with the implementations of all four methods.
- Ensure your code is well-documented with comments explaining the logic behind each step.
- Fill the table with the roots found for each and submit it in a separate PDF file.
- Also mention the number of iterations that was required to solve for each.

(81)(d) Number of iterations that was required to solve each:

	Bisection	Newton-Raphson	Secant	Fixed-Point Iteration
e^{-x}	16	4	3	2000
e^{-x}	16	24	16	2000
e^{-x}	16	41	3	2000
e^{-x}	16	31	35	2000
e^{-x}	16			

In (81) for equation (2) and equation 4, I didn't get the correct value using Fixed-point iteration because I was not able to find the correct value of $g(n)$ ($n = g(n)$).

For equation:

$$n^3 - n - 2 = 0$$

1st I took $g(n) = n^3 - 2$, but I did not get any answer.

then I took it as:

$$n(n^2 - 1) - 2 = 0 \Rightarrow n = \frac{2}{n^2 - 1}$$

$$\therefore g(n) = \frac{2}{n^2 - 1}$$

I took this, but didn't get the value that I got from the other methods.