Coding Assignment 7
Partial Differential Equations and Finding Zeros

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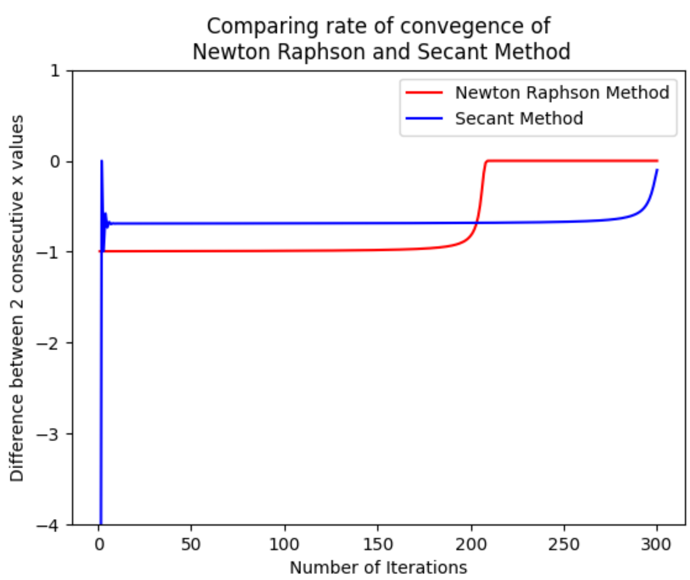
Q1. Approach Mentioned in comments.
Plotted the temperatures at different positions of the rod, with the varying time. Added the gif of the animation in the submission. At the boundary the temperature remains 0 (given) and due to heat conduction, temperature starts increasing at points between the rods, which then again starts decreasing with time.

Q3. Approach Mentioned in comments.
Output for:

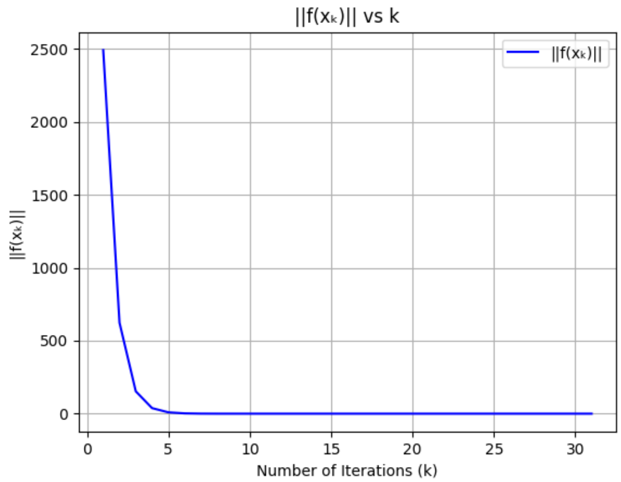
15th root of 5^15 is 4.999998218192456

Q4. Approach Mentioned in comments.



As is visible from the graph the difference between consecutive root value approximations reaches 0 earlier in Newton Raphson Method, thus it converges faster than the Secant Method.

Q5. Approach Mentioned in comments.



Root of the given function is: [0.83328161 0.03533462 -0.49854928]

As can be viewed from the graph, as number of iterations increases, we finally find the root using Newton Raphson method, and thus the $||f(x_k)||$ becomes 0 eventually.

Q6. Approach Mentioned in comments.

Polynomial formed by using Aberth method on array [1,3,5,7,9] is:

$-945+1689x-950x^2+230x^3-25x^4+x^5$

Roots of this polynomial are:

(8.999995233565112+1.4875592780697056e-06j)

(2.99983406747212+0.0003067931701210844j)

(0.9999999999999954-8.19810176538318e-15j)

(4.999873094095273-0.0004686835584039595j)

(7.000051798413883+0.000153302588505929j)

Q7. Approach Mentioned in comments.

Real roots of the function: sin(x) in the interval (0,10) are:

5.6884358934637325

5.8327415892157255

9.4247610768563

8.980127895169797

6.283184551174765

3.1415843142363733