Simulation Lab(MC503)

Assignment-4

Try to solve all the problems

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1. For $n = 10$, evaluate $\int_0^5 \frac{x}{1+x} dx$ using Simpson's 1/3 and Trapezoidal rule. Also, find the true error and absolute relative true error for this integral. (Both are numerical methods to solve the integration.)

2. Using the Bisection method, find the real roots of the equation $x^3 - x - 1$ with accuracy up to 3 digits fo decimal. (Don't use inbuild package in R.)

Algorithm:

1: Find points a and b such that $a < b$ and $f(a) \cdot f(b) < 0$.
2: Take the interval $[a, b]$ and find next value $x_0 = \frac{a+b}{2}$.
3: If $f(x_0) = 0$ then x_0 is an exact root,
4: else if $f(a) \cdot f(x_0) < 0$ then $b = x_0$,
5: else if $f(x_0) \cdot f(b) < 0$ then $a = x_0$.
6: Repeat steps 2 & 3 until $f(x_i) = 0$ or $|f(x_i)| \leq Accuracy$.

3. Examine the patterns of the *bestseller.csv* data using a heatmap plot. Also, set the title, labels and customize the colour of your plots.

4. Create 3Dpie chart for the AQI of the given Indian States on 13 Sep 2023. Also, add title of the chart, slice percentage and chart legend.

State	Aandhra	Aruranchal	Bihar	Chandighar	Delhi	Kerala	Panjab	UP
AQI	59	79	110	168	92	85	113	102

5. Draw a contour plot for the function $f(x, y) = 2x^2 + 2y^2$, where $x, y \in [-20, 20]$. Add title and palette colour.

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