**BS-3304L Numerical Analysis Lab**

**Open Ended Lab**

**Comparison between Simpson’s 1/3rd and Trapezoidal Rule**

**Problem Statement:**

Write a function that takes the values of a and b from the user and compares the value of Simpson's 1/3rd rule and Trapezoidal rule for following function at each iteration step:

**Code:**

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| clear all, clc    %% Defining  f = @(x) cos(2\*x);    %a = 0;  %b = 3.142;  %N = 6;    disp('Enter the value of a')  a = input('Value of a: ');  fprintf("\n")    disp('Enter the value of b')  b = input('Value of b: ');  fprintf("\n")    disp('Enter Value of N')  N = input('No. of intervals: ');  fprintf("\n")    %% Trapozoidal Rule  hT = (b - a) / N;  sumT = 0;    for j = 1:N  x\_1 = a + ((j - 1) \* hT);  x\_2 = a + (j \* hT);    y\_1 = f(x\_1);  y\_2 = f(x\_2);    areaT = (y\_1 + y\_2)\*(hT/2);  sumT = sumT + areaT;    Trapozide(j) = sumT;    %fprintf('Y: %.2f, Area: %.2f, Sum: %.4f\n',y\_1, areaT, sumT)  end    %% Simpson Rule  sumS = 0;  hS = (b - a) / N;    for j = 1:N  x1 = a + ((j - 1) \* hS);  x2 = a + (j \* hS);    y1 = f(x1);  y2 = f(x1 + hS/2);  y3 = f(x2);    areaS = (hS/6) \* (y1 + y3 + 4\*y2);  sumS = sumS + areaS;    Simpson(j) = sumS;    %fprintf('Y: %.4f, Area: %.2f, Sum: %.4f\n', y1, areaS, sumS)  end    %% Print Statements  fprintf("Iteration Trapazoidal Simpson\n")  for k = 1:N  if Trapozide(k) < 0 && Simpson(k) < 0 && k < 10  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) >= 0 && Simpson(k) >= 0 && k < 10  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) < 0 && Simpson(k) < 0 && k >= 10 && k < 100  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) >= 0 && Simpson(k) >= 0 && k >= 10 && k < 100  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) < 0 && Simpson(k) < 0 && k >= 100 && k < 1000  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) >= 0 && Simpson(k) >= 0 && k >= 100 && k < 1000  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) < 0 && Simpson(k) < 0 && k >= 1000  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  elseif Trapozide(k) >= 0 && Simpson(k) >= 0 && k >= 1000  fprintf("%.0f %.4f %.4f\n", k, Trapozide(k), Simpson(k))  end  end |

**Command Window:**

