Experiment – 2

AIM : - To test the convergence of given series ( array provided )

CODE :-

clc;clf;clear;

*// Function to compute series term based on user-defined formula*

function **a**=series\_term(**n**, **formula**)

**a** = evstr(**formula**); *// Evaluate the user-provided formula*

endfunction

*// Main function to test series convergence and plot results*

function series\_convergence\_test(**n\_max**)

*// Get the series formula from the user*

disp("Enter the series formula in terms of (e.g., 1/factorial(n), 1/n^2):");

formula = input("Formula: ", "string");

if **n\_max** <= 1 then

disp("n\_max must be greater than 1.");

return;

end

series\_terms = zeros(1, **n\_max**); *// To store series terms*

partial\_sums = zeros(1, **n\_max**); *// To store partial sums*

ratios = zeros(1, **n\_max** - 1); *// To store ratio test values*

*// Calculate series terms, partial sums, and ratios*

for n = 1:**n\_max**

series\_terms(n) = series\_term(n, formula);

if n == 1 then

partial\_sums(n) = series\_terms(n);

else

partial\_sums(n) = partial\_sums(n - 1) + series\_terms(n);

end

if n < **n\_max** then

ratios(n) = abs(series\_term(n + 1, formula) / series\_term(n, formula));

end

end

*// Check convergence with an improved approach:*

*// If the terms approach zero and ratios decrease, then the series converges*

convergent = max(ratios) < 1 && abs(series\_terms($)) < 1e-6;

if convergent then

disp("The series is convergent.");

else

disp("The series is divergent.");

end

*// Plot results*

clf;

subplot(2, 1, 1); *// Plot series terms*

plot(1:**n\_max**, series\_terms, 'g-o');

xlabel('n');

ylabel('a(n)');

title('Series Terms: a(n)');

subplot(2, 1, 2); *// Plot partial sums*

plot(1:**n\_max**, partial\_sums, 'r-o');

xlabel('n');

ylabel('S(n)');

title('Partial Sums: S(n) = Σ a(k)');

endfunction

*// Test the program*

n\_max = 20; *// Number of terms to evaluate*

series\_convergence\_test(n\_max);

OUTPUT : -

