

%Assignment 3 question 1

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syms f(x)

f(x) = exp(-1 * x * x);

%Actual value of g(1)

actual_val = 0.74682413;

subintervals = [50 ; 100 ; 200];

rect = [];

trap = [];

simp = [];

for N = [50, 100, 200]

 x_cor = linspace(0,1,N+1);

 h = x_cor(2)-x_cor(1);

 y_cor = zeros(N+1,1);

 ym_cor = zeros(N,1);

 for i = 1:N+1

 y_cor(i) = f(x_cor(i));

 end

 for i = 1:N

 ym_cor(i) = f(x_cor(i)+h/2);

 end

 rect_I = sum(y_cor(1:N)) * h;

 trap_I = (2 * sum(y_cor(2:N)) + y_cor(1) + y_cor(N+1)) * h/2;

 simp_I = (2 * sum(y_cor(2:N)) + y_cor(1) + y_cor(N+1) + 4 * sum(ym_cor))*h/6;

 fprintf('For N = %d\n', N)

 fprintf('g(1) by R rule = %.8f with error %.8f\n', rect_I, rect_I-actual_val)

 fprintf('g(1) by T_rule = %.8f with error %.8f\n', trap_I, trap_I-actual_val)

 fprintf('g(1) by S_rule = %.8f with error %.8f\n', simp_I, simp_I-actual_val)

 rect = [rect ; rect_I];

 trap = [trap ; trap_I];

 simp = [simp ; simp_I];

end

E_R = rect-actual_val;

E_T = trap - actual_val;

E_S = simp - actual_val;

VarNames = {'N', 'R rule', 'T rule', 'S rule', 'E R', 'E T', 'E S'};

T = table(subintervals,rect,trap,simp,E_R,E_T,E_S, 'VariableNames',VarNames)

For N = 50

g(1) by R rule = 0.75312081 with error 0.00629668

g(1) by T_rule = 0.74679961 with error -0.00002452

g(1) by S_rule = 0.74682413 with error 0.00000000

For N = 100

g(1) by R rule = 0.74997860 with error 0.00315447

g(1) by T_rule = 0.74681800 with error -0.00000613

g(1) by S_rule = 0.74682413 with error 0.00000000

For N = 200

g(1) by R rule = 0.74840290 with error 0.00157877

g(1) by T_rule = 0.74682260 with error -0.00000153

g(1) by S_rule = 0.74682413 with error 0.00000000

T =

3×7 table

N	R rule	T rule	S rule	E R	E T	E S
50	0.75312	0.7468	0.74682	0.0062967	-2.4523e-05	2.8942e-09
100	0.74998	0.74682	0.74682	0.0031545	-6.1285e-06	2.8175e-09
200	0.7484	0.74682	0.74682	0.0015788	-1.53e-06	2.8127e-09

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