

Lab Assignment 05

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Lab no: - 05

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Question 1
N      Rrule      Trule      Srule      Er      Et      Es
50     0.738183829585  0.746799607189  0.746824134120  0.008640300415  0.000024522811  0.000000004120
100    0.742510301001  0.746818001468  0.746824132894  0.004313828999  0.000006128532  0.000000002894
200    0.744668773010  0.746822599980  0.746824132818  0.002155356990  0.000001530020  0.000000002818

Question 2
simple trapezoidal rule: value= 0.080830895780053993, error = -0.000000000219946006
simple trapezoidal rule: value= 0.080830895780053993, error = -0.000000000219946006

Question 3

for m=1: P= 0.6826894930
for m=2: P= 0.9544997330>>
```

Code

Q1

```
clear;
clc;

% Question(1)
fprintf('\n Question 1 \n');
f=@(x) exp(-x.^2);
a=0; b=1;
N=[50,100,200];

fprintf("N      Rrule      Trule      Srule      Er\n");
for i=1:3
    Iab=integral(f,a,b);
    X=linspace(a,b,N(i));
    y=f(X);
    g1=0.74682413;

    % (1) Rectangle Rule

    % figure;
    % ezplot(f,[a,b]);
    % hold on ;
```

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%      stairs(x,y,'r'); stem(x,y,'r.');
%      hold off;
    Ir =0;
    h=(b-a)/N(i);
    for k=1:N(i)-1
        Ir =Ir+h*y(k);
    end
    Er=abs(g1-Ir);

% (2) Trapezoidal rule

s= 0.5*(f(a)+f(b));
h=(b-a)/N(i);
for k=1:N(i)-1
    s=s+f(a+ k*h);
end
It=h*s;
Et=abs(It-g1);

% (3) Simpson's rule
s1=f(a)+f(b);
for k=1:2:N(i)-1
    s1=s1+4*f(a+k*h);
end

for k=2:2:N(i)-2
    s1=s1+2*f(a+k*h);
end

Is=(h/3)*s1;
Es=abs(Is-g1);


    fprintf("%d      %.12f      %.12f      %.12f      %.12f      %.12f      %.12f\n",N(i),Ir,h*s,(h/3)*s1,Er,Et,Es);

end

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q2

```

clear all;
format long;
fprintf('\n Question 2 \n');
a=0;
b=1;
n=100;
ans= 0.0808308960;
fprintf('simple trapezoidal rule: value= %.18f, error = %.18f\n',trap(100),trap(100)-ans)
fprintf('simple trapezoidal rule: value= %.18f, error = %.18f',corr_trap(100),corr_trap(100)-ans)

function fv=f(x)
fv= x*x*exp(-2*x);

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end
function gv=g(x)
gv= 2*x*(exp(-2*x))-2*x*x*exp(-2*x);
end

function tv=trap(n)
b=1;a=0;
h=(b-a)/n;
s=0.5*(f(b)+f(a));
for i=1:n-1
s=s+f(a+i*(h));
end
tv=s*h;
end

function tv=corr_trap(n)
b=1;a=0;
h=(b-a)/n;
s=0.5*(f(b)+f(a));

derfa= g(0);
derfb= g(1);
for i=1:n-1
s=s+f(a+i*(h));
end
s=s+(h/12)*(derfa-derfb);
tv=s*h;
end

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q3

```

fprintf('\n Question 3 \n');
fprintf('\n for m=1: P= %.10f\n',simpson(100,1))
fprintf('for m=2: P= %.10f',simpson(100,2))
function fv=f(z)
fv= exp(-z*z/2);
end
function sv=simpson(n,m)
b=m;a=-m;
h=(b-a)/n;
s=(f(b)+f(a));
for i=1:n-1
if rem(i,2)==0
s=s+2*(f(a+i*h));
else
s=s+4*(f(a+i*h));
end
%s=s+f(a+i*(h));
end
sv=(1/sqrt(2*pi))*(s*h/3);
end

```