Lab Assignment 05

Name: - Anubhav Bajaj

Roll no: - 190123007

Lab no: - 05

```
 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
Et                   Es\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

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=1:1: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
```

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);
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
```

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
```