

Name : Hritik Kumar

Student Id : 202051088

Exercise 1

```
a=-10;  
b=10;  
n=90;  
lambda = [0.01,0.1,1,10,100];  
for i=1:1:length(lambda)  
f=@(x) sin(lambda(i)*x)/x;  
Trapezoidal_Rule(a,b,n,f);  
end
```

```
result = 0.1977  
result = 1.8699  
result = 3.0938  
result = 0.9100  
result = -0.2298
```

```
x=0;  
y=5*pi;  
m=90;  
lambda = [0.01,0.1,1,10,100];  
for i=1:1:length(lambda)  
g=@(x) exp(sin(lambda(i)*x));  
Trapezoidal_Rule(x,y,m,g);  
end
```

```
result = 17.0060  
result = 31.0435  
result = 22.1135  
result = 19.8873  
result = 19.8873
```

Exercise 2

```
lower=-10;  
upper=10;  
f=@(x1,x2,x3,x4,x5,x6,x7,x8) exp(-1/2*(x1.^2 + x2.^2 + x3.^2 + x4.^2 ...  
+ x5.^2 + x6.^2 + x7.^2 + x8.^2));  
  
N = 1000;  
  
x1 = lower + (upper - lower)*rand(1,N)
```

```
x1 = 1x1000  
5.6045 -8.5579 -4.1527 -8.1621 -4.4581 -9.0532 -3.6327 9.0226 ...
```

```

x2 = lower + (upper - lower)*rand(1,N);
x3 = lower + (upper - lower)*rand(1,N);
x4 = lower + (upper - lower)*rand(1,N);
x5 = lower + (upper - lower)*rand(1,N);
x6 = lower + (upper - lower)*rand(1,N);
x7 = lower + (upper - lower)*rand(1,N);
x8 = lower + (upper - lower)*rand(1,N);

value = (20*8)/N * sum(f(x1,x2,x3,x4,x5,x6,x7,x8))

value = 2.1538e-12

```

```
fprintf("The value of integral : %0.5f",value);
```

```
The value of integral : 0.00000
```

Exercise 3

```

% interval
a = -10;
b = 10;
% numebr of samples
N=1000;
lambda = [0.01,0.1,1,10,100];
for i=1:length(lambda)
f=@(x) sin(lambda(i)*x)/x;

% integral value

    % samples
    xS = a+(b-a)*rand(1,N);
% sum(f(xS))
    % Monte Carlo integration
    intMC = (b-a)*sum(f(xS))/N;

stderr= std(sin(xS)/xS)/sqrt(1000);
fprintf("integration value %5f and standard error %5f\n",intMC,stderr)
end

```

```

integration value 0.000200 and standard error 0.000000
integration value 0.001804 and standard error 0.000000
integration value 0.000463 and standard error 0.000000
integration value 0.000028 and standard error 0.000000
integration value -0.000023 and standard error 0.000000

```

```

a = 0;
b = 5*pi;
% numebr of samples
N=1000;

```

```

lambda = [0.01,0.1,1,10,100];
for i=1:1:length(lambda)
f=@(x) sin(lambda(i)*x)/x;

% integral value

% samples
xS = a+(b-a)*rand(1,N);
% sum(f(xS))
% Monte Carlo integration
intMC = (b-a)*sum(f(xS))/N;

stderr= std(sin(xS)/xS)/sqrt(1000);
fprintf("integration value %5f and standard error %5f \n",intMC,stderr)
end

```

```

integration value 0.000157 and standard error 0.000000
integration value 0.001224 and standard error 0.000000
integration value 0.000192 and standard error 0.000000
integration value -0.000007 and standard error 0.000000
integration value -0.000010 and standard error 0.000000

```

```

function Trapezoidal_Rule(a,b,n,f)
h=(b-a)/n;
sum=0;
for i=1:1:n-1
if a+i*h ~= 0
sum = sum + f(a+i*h);
end
end
result = h/2*(f(a)+f(b)+2*sum)
end

```