Practical 4: Numerical Integration

(a) Programming for numerical integration using Trapezoidal rule.

Problem Statement: Write and execute Scilab code for the following:

Evaluate $\int_0^1 y\,dx$,Using Trapezoidal Rule and following data.

x	y
0	1
0.2	1.0857
0.4	1.1448
0.6	1.179
0.8	1.1891
1	1.1755

Scilab Code:

```
clc;
clear;
x=[0 0.2 0.4 0.6 0.8 1];
y=[1 1.0857 1.1448 1.1790 1.1891 1.1755];
h=x(2)-x(1);
n=length(x);
area=0;
for i=1:n
   if i==1|i==n then
      area=area+y(i)
   else
      area=area+2*y(i)
end
end
area=area*(h/2);
printf("Value of integration by Trapezoidal Rule is=%f",area);
```

Output:

```
Value of integration by Trapezoidal Rule is=1.137270
-->
```

(b) Programming for numerical integration using Simpson's 1/3 rule.

Problem Statement:

Evaluate $\int_0^1 x^2/1+x^3\,dx$,Using Simpson's 1/3 Rule with h=0.25.

x	y
0	0
0.25	0.0615
0.5	0.2222
0.75	0.3956
1	0.5

Scilab Code:

```
clc;
clear;
x=[0 0.25 0.50 0.75 1.00];
y=[0 0.0615 0.2222 0.3956 0.5];
h=x(2)-x(1);
n=length(x);
area=0;
for i=1:n
   if i==1|i==n then
      area=area+y(i)
   elseif (modulo(i-1,2))==0 then
      area=area+2*y(i)
   elseif (modulo(i-1,2))~=0 then
      area=area+4*y(i)
end
end
area=area*(h/3);
printf("Value of integration by Simpsons 1/3 Rule is=%f",area);
```

Output:

```
Value of integration by Simpsons 1/3 Rule is=0.231067
-->
```

(c) Programming for numerical integration using Simpson's 3/8 rule.

Problem Statement:

Evaluate $\int_0^6 dx/1+x^2$,Using Simpson's 3/8 Rule with h=1.

x	y
0	1
1	0.5
2	0.2
3	0.1
4	0.0588
5	0.0385
6	0.027

Scilab Code:

```
clc;
clear;
x=[0 1 2 3 4 5 6];
y=[1 0.5 0.2 0.1 0.0588 0.0385 0.0270];
h=x(2)-x(1);
n=length(x);
area=0;
for i=1:n
   if i==1|i==n then
      area=area+y(i)
   elseif (modulo(i-1,2))==0 then
      area=area+2*y(i)
   elseif (modulo(i-1,2))~=0 then
      area=area+3*y(i)
end
end
area=area*(3*h/8);
printf("Value of integration by Simpsons 3/8 Rule is=%f",area);
```

Output:

```
Value of integration by Simpsons 3/8 Rule is=1.297538
--> 
```