PRACTICAL-12

Simpson 1/3 Method

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Ques-1

In[16]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := 1 / x;
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[1 / x, {x, 1, 2}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

```
For n=10,Simpson estimate is: 0.69315

True value is 0.693147

Absolute error is 3.05013×10^-6
```

Ques-2(i)

In[31]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := Log[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[Log[x], {x, 4, 5.2}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

For n=6,Simpson estimate is: 1.82785

True value is 1.82785

Absolute error is 1.50624×10^{-7}

Ques-2(ii)

In[46]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := Log[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[Log[x], {x, 4, 5.2}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

For n=12,Simpson estimate is: 1.82785

True value is 1.82785

Absolute error is 9.44762×10^{-9}

Ques-3

In[61]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := Sin[x] - Log[x] + Exp[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[Sin[x] - Log[x] + Exp[x], {x, 0.2, 1.4}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

```
For n=12,Simpson estimate is: 4.05106

True value is 4.05095

Absolute error is 0.000109616
```

Ques-4

In[76]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := Sin[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[Sin[x], {x, 0, Pi / 2}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

```
For n=6,Simpson estimate is: 1.00003

True value is 1.

Absolute error is 0.0000263122
```

Ques-5

In[91]:=
```
a = Input["Enter the left end point:"];
b = Input["Enter the right end point:"];
n = Input["Enter the number od sub intervals to be formed:"];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := Sqrt[x] * Exp[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 4 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
Sn = (h / 3) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n=", n, ",Simpson estimate is: ", Sn]
in = NIntegrate[Sqrt[x] * Exp[x], {x, 1, 2}];
Print["True value is ", in]
Print["Absolute error is ", Abs[Sn - in]]
```

For n=12,Simpson estimate is: 5.85023

True value is 5.85023

Absolute error is 2.95573×10^{-6}