Practical 7 (b)

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Simpson Method

Q1.

```
a = Input["Enter the left end point: "];
b = Input["Enter the right end point: "];
n = Input["Enter the number of 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 += 2 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumeven += 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]
in1 = Integrate[1/x, {x, 1, 2}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

```
For n= 6 Simpson estimate is :0.463252
```

```
Log[2]
```

```
True value is Log[2]
```

```
Absolute error is 0.229896
```

Q2.

```
a = Input["Enter the left end point: "];
b = Input["Enter the right end point: "];
n = Input["Enter the number of 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 += 2 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumeven += 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]
in1 = Integrate[Log[x], {x, 4, 5.2}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

```
For n= 6 Simpson estimate is :17.9182
```

```
1.82785
```

```
True value is 1.82785
```

```
Absolute error is 16.0903
```

Q3.

```
a = Input["Enter the left end point: "];
b = Input["Enter the right end point: "];
n = Input["Enter the number of 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 += 2 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumeven += 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]
in1 = Integrate[Sin[x] - Log[x] + Exp[x], {x, 0.2, 1.4}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

For n= 6 Simpson estimate is :3.95045×10^{8}

```
4.05095
```

```
True value is 4.05095
```

Absolute error is 3.95045×10^{8}

Q4.

```
a = Input["Enter the left end point: "];
b = Input["Enter the right end point: "];
n = Input["Enter the number of 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 += 2 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumeven += 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]
in1 = Integrate[Sin[x], {x, 0, π/2}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

```
For n= 6 Simpson estimate is :-0.62943

1

True value is 1

Absolute error is 1.62943
```

Q5.

```
a = Input["Enter the left end point: "];
b = Input["Enter the right end point: "];
n = Input["Enter the number of sub intervals to be formed: "];
h = (b - a) / n;
y = Table[a + i * h, {i, 1, n}];
f[x] := (x^0.5) * Exp[x];
sumodd = 0;
sumeven = 0;
For[i = 1, i < n, i += 2, sumodd += 2 * f[x] /. x → y[[i]]];
For[i = 2, i < n, i += 2, sumeven += 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]
in1 = Integrate[(x^0.5) * Exp[x], {x, 1, 2}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

For n= 6 Simpson estimate is :1.73692×10^9

```
5.85023
```

True value is 5.85023

Absolute error is 1.73692×10^9