Practical 7 (a)

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Trapezoidal 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] := 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]]];
Tn = (h / 2) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n= ", n, " Trapezoidal estimate is :", Tn]
in = Integrate[Log[x], {x, 4, 5.2}]
Print["True value is ", in]
Print["Absolute error is ", Abs[Tn - in]]
```

```
For n= 6 Trapezoidal estimate is :26.8772
```

```
1.82785
```

```
True value is 1.82785
```

```
Absolute error is 25.0494
```

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] := 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]]];
Tn = (h / 2) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n= ", n, " Trapezoidal estimate is :", Tn]
in1 = Integrate[Sin[x], {x, 0, π/2}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Tn - in1]]
```

```
For n= 6 Trapezoidal estimate is :-0.944145
```

```
1
```

```
True value is 1
```

```
Absolute error is 1.94415
```

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]]];
Tn = (h / 2) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n= ", n, " Trapezoidal estimate is :", Tn]
in1 = Integrate[Sin[x] - Log[x] + Exp[x], {x, 0.2, 1.4}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Tn - in1]]
```

```
For n= 6 Trapezoidal estimate is :5.92567×10^8
```

```
4.05095
```

```
True value is 4.05095
```

```
Absolute error is 5.92567×10^8
```

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] := 1/(1 + x^2);
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]]];
Tn = (h / 2) * ((f[x] /. x → a) + N[sumodd] + N[sumeven] + (f[x] /. x → b));
Print["For n= ", n, " Trapezoidal estimate is :", Tn]
in1 = Integrate[1/(1 + x^2), {x, 0, 1}]
Print["True value is ", in1]
Print["Absolute error is ", Abs[Tn - in1]]
```

```
For n= 6 Trapezoidal estimate is :0.0501042
```

$$\frac{\pi}{4}$$

True value is $\frac{\pi}{4}$

```
Absolute error is 0.735294
```