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B.Com(Hons)

Simpson Method

In[75]:=
```
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 += 4 * 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]
in = Integrate[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

Out[87]= Log[2]

True value is Log[2]

Absolute error is 3.05013×10^{-6}

In[60]:=
```
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 += 4 * 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]
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

Out[72]= 0.693147

True value is 0.693147

Absolute error is 3.05013×10^{-6}

Q2

In[135]:=
```
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 += 4 * 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 :1.82785

Out[147]= 1.82785

True value is 1.82785

Absolute error is 1.50624×10^{-7}

In[150]:=
```
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 += 4 * 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= 12 Simpson estimate is :1.82785

Out[162]= 1.82785

True value is 1.82785

Absolute error is 9.44753×10^{-9}

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 += 4 * 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}] π
Print["True value is ", in1]
Print["Absolute error is ", Abs[Sn - in1]]
```

For n= 12 Simpson estimate is :4.05106

Out[192]= 4.05095

True value is 4.05095

Absolute error is 0.000109616

Q4

In[195]:=
```
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 += 4 * 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= 12 Simpson estimate is :1.

Out[207]= 1

True value is 1

Absolute error is 1.63444×10^{-6}

In[210]:=
```
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 += 4 * 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 :1.00003

Out[222]= 1

True value is 1

Absolute error is 0.0000263122

In[225]:=
```
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 += 4 * 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= 12 Simpson estimate is :5.85023
```

Out[237]= 5.85023

```
True value is 5.85023
```

Absolute error is 2.95573×10^{-6}