Practical 7A :- Trapezoidal Rule

Q1 ∫1/x^2 dx from 1 to 5

In[17]:=
```
f[x_] = 1 / x ^ 2;
a = 1;
b = 5;
n = 10;
h = (b - a) / n;
sol = (h / 2) * (f[a] + 2 * Sum[f[i], {i, a + h, b - h, h}] + f[b]);
in = Integrate[1 / x ^ 2, {x, 1, 5}];
Print["Exact Value of Integral is: ", in]
Print["Approximate value of Integral is: ", N[sol]]
Print["Error in Integral is: ", Abs[in - N[sol]]]
```

```
                            4
Exact Value of Integral is: ─
                            5

Approximate value of Integral is: 0.825681

Error in Integral is: 0.0256813
```

Q2 ∫e^-x^2 from 0 to 0. 6

In[87]:=
```
f[x_] = Exp[-x ^ 2];
a = 0;
b = .6;
n = 10;
h = (b - a) / n;
sol = (h / 2) * (f[a] + 2 * Sum[f[i], {i, a + h, b - h, h}] + f[b]);
in = Integrate[Exp[-x ^ 2], {x, 0, .6}];
Print["Exact Value of Integral is: ", in]
Print["Approximate value of Integral is: ", N[sol]]
Print["Error in Integral is: ", Abs[in - N[sol]]]
```

```
Exact Value of Integral is: 0.535154

Approximate value of Integral is: 0.534902

Error in Integral is: 0.000251232
```

Q ∫1/1+x^2 from 0 to 0.6 and h=0.1

```
In[188]:=  f[x_] = 1 / (1 + x ^ 2);
           a = 0;
           b = 0.6;
           h = 0.1;
           sol = (h / 2) * (f[a] + 2 * Sum[f[i], {i, a + h, b - h, h}] + f[b]);
           in = N[Integrate[1 / (1 + x ^ 2), {x, 0, 0.6}]];
           Print["Exact Value of Integral is: ", in]
           Print["Approximate value of Integral is: ", N[sol]]
           Print["Error in Integral is: ", Abs[in - N[sol]]]

           Exact Value of Integral is: 0.54042

           Approximate value of Integral is: 0.539878

           Error in Integral is: 0.000541031
```

Q4 $\int x^2/1+x^3 \, dx$ from 0 to 1 and h=0.25

```
In[167]:=  f[x_] = x ^ 2 / (1 + x ^ 3);
           a = 0;
           b = 1;
           h = 0.25;
           sol = (h / 2) * (f[a] + 2 * Sum[f[i], {i, a + h, b - h, h}] + f[b]);
           in = N[Integrate[x ^ 2 / (1 + x ^ 3), {x, 0, 1}]];
           Print["Exact Value of Integral is: ", in]
           Print["Approximate value of Integral is: ", N[sol]]
           Print["Error in Integral is: ", Abs[in - N[sol]]]

           Exact Value of Integral is: 0.231049

           Approximate value of Integral is: 0.232341

           Error in Integral is: 0.00129221
```

Q4 $\int \sin x \, dx$ from 0 to π

```
In[117]:=  f[x_] = Sin[x];
           a = 0;
           b = Pi;
           n = 11;
           h = (b - a) / n;
           sol = (h / 2) * (f[a] + 2 * Sum[f[i], {i, a + h, b - h, h}] + f[b]);
           in = Integrate[Sin[x], {x, 0, Pi}];
           Print["Exact Value of Integral is: ", in]
           Print["Approximate value of Integral is: ", N[sol]]
           Print["Error in Integral is: ", Abs[in - N[sol]]]

           Exact Value of Integral is: 2

           Approximate value of Integral is: 1.98639

           Error in Integral is: 0.013613
```