DEEN DAYAL UPADHYAYA COLLEGE

UNIVERSITY OF DELHI

PRACTICAL FILE

SUBJECT: NUMERICAL METHODS

COURSE: B.Sc. MATHEMATICAL SCIENCES

YEAR: THIRD

SEMESTER: SIXTH

SUBMITTED BY:	SUBMITTED TO:
Sneha Gupta (21mts5735)	Dr. RASHMI GUPTA (ASSISTANT PROFESSOR)

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%Name: Sneha Gupta
%Rollno :21mts5735%

In[17]:= Date:19/03/24(Practical 7)
%Trapezoidalrule%

In[17]:= Date : 19 / 03 / 24
Trapezoidal rule %

```
In[12]:= trapezoidalRule[a0_, b0_, n_, f_] := Module[{a = a0, b = b0, h, ai}, h = (b - a) / n;
    ai = h / 2 (f[a] + f[b] + 2 Sum[f[a + h * k], {k, 1, n-1}]);
    Return[ai];]
  f[x_] := 1 / (1 + x)
  N[trapezoidalRule[0, 1, 2, f]]
```

$$ai = h/2\left(f[a] + f[b] + 2\sum_{k=1}^{n-1} f[a + h * k]\right);$$

Out[14]= 0.708333

In[15]:= N[trapezoidalRule[0, 1, 4, f]]

Out[15]= 0.697024

In[16]:= N[trapezoidalRule[0, 1, 8, f]]

Out[16]= 0.694122

In[2]:= (* %Name- Sneha Gupta %
%Roll no.- 21mts5735%
%Date-09-04-2024(PRACTICAL 8)%

In[5]:=

(*Aim: to approximate the value of integrals $\int_0^1 x\,dx$, $\int_0^1 \text{Exp}(-x)\,dx$ and $\int_0^1 1/(1+x^2)\,dx$ using Simpson Rule*)
(*Programming*)

In[6]:=

```
simpsonRule[a_, b_, f_] := Module[{}, k = ((b - a) / 6) * (f[a] + 4 f[(a + b) / 2] + f[b]);
  Print["integral value is:", k];]
```

In[7]:=

```
f[x_] := x
```

In[8]:=

```
simpsonRule[0, 1, f]
```

integral value is: $\frac{1}{2}$

In[9]:=

```
f[x_] := E^(-x)
```

In[10]:=

```
simpsonRule[0, 1, f]
```

integral value is: $\frac{1}{6}\left(1+\frac{1}{e}+\frac{4}{\sqrt{e}}\right)$

In[11]:=

```
f[x_] := 1/(1 + x^2)
```

In[12]:=

```
simpsonRule[0, 1, f]
```

integral value is: $\frac{47}{60}$

%09-04-2024(PRACTICAL 8)%

In[5]:=

```
(* %Name- Sneha Gupta   %
   %Roll no.- 21mts5735%
   %Date-09-04-2024(PRACTICAL 9)%
   Aim- Euler method *)(*Programming
 *)
```

```
Aim- Euler method *)
(*Programming *)
eulerMethod[a0_, b0_, h0_, f_, y0_] := Module[{a = a0, b = b0, h = h0, n, xi},
  n = (b - a) / h;
  xi = Table[a + h * (j - 1), {j, 1, n + 1}];
  yi = Table[0, {n + 1}];
  yi[[1]] = y0;
  OutputDetails = {{0, xi[[1]], y0}};
  For[i = 1, i ≤ n, i = i + 1,
   yi[[i + 1]] = yi[[i]] + h * f[xi[[i]], yi[[i]]];
   OutputDetails = Append[OutputDetails, {i, N[xi[[i + 1]]], N[yi[[i + 1]]]}]];
  Grid[Prepend[Transpose[{Range[0, n], xi, yi}], {"i", "xi", "yi"}],
   Frame → All, Alignment → Right]]
```

```
In[29]:= f[x_, y_] := 2 x + y;
         eulerMethod[0, 1, 0.2, f, 1]
```

Out[30]=

i	xi	yi
0	0.	1
1	0.2	1.2
2	0.4	1.52
3	0.6	1.984
4	0.8	2.6208
5	1.	3.46496