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Practical 13
Euler's method

AIM :- APPROXIMATING SOLUTION TO INITIAL VALUE PROBLEMS USING EULER's METHOD

In[1]:=
```
EulerMethod[a0_, b0_, h0_, f_, y0_] := Module[{a = a0, b = b0, h = h0, n, xi},
  n = (b - a) / h;
  xi = Table[a + (j - 1) * h, {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]]]}]];
  Print[NumberForm[
    TableForm[OutputDetails, TableHeadings -> {None, "i", "xi", "yi"}], 9
```

(i) y'[x] = f[x,y] = 2 x + y ; y[x0] = y0

In[2]:=
```
f[x_, y_] := 2 * x + y
a0 = 0;
b0 = 1;
h0 = 0.2;
y0 = 1;
EulerMethod[a0, b0, h0, f, y0]
```

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

In[8]:=
```
Clear[a0, b0, h0, f, y0]
```

Alternative Method

In[9]:=
```
EulerMethodA[a0_, b0_, h0_, f_, y0_] := Module[{a = a0, b = b0, h = h0, n, xi},
  n = (b - a) / h;
  Print["i", "     ", "xi[[i]]", "     ", "yi[[i]]"];
  xi = Table[a + (j - 1) * h, {j, 1, n + 1}];
  yi = Table[0, {n + 1}];
  yi[[1]] = y0;
  For[i = 1, i <= n, i = i + 1,
   Print[i - 1, "       ", xi[[i]], "          ", yi[[i]]];
   yi[[i + 1]] = yi[[i]] + h * f[xi[[i]], yi[[i]]]; ];
```

In[10]:=
```
f[x_, y_] := 2 * x + y
a0 = 0;
b0 = 1;
h0 = 0.2;
y0 = 1;
EulerMethodA[a0, b0, h0, f, y0]
```

```
i     xi[[i]]     yi[[i]]
0       0.          1
1       0.2         1.2
2       0.4         1.52
3       0.6         1.984
4       0.8         2.6208
```

In[16]:=
```
Clear[a0, b0, h0, f, y0]
```