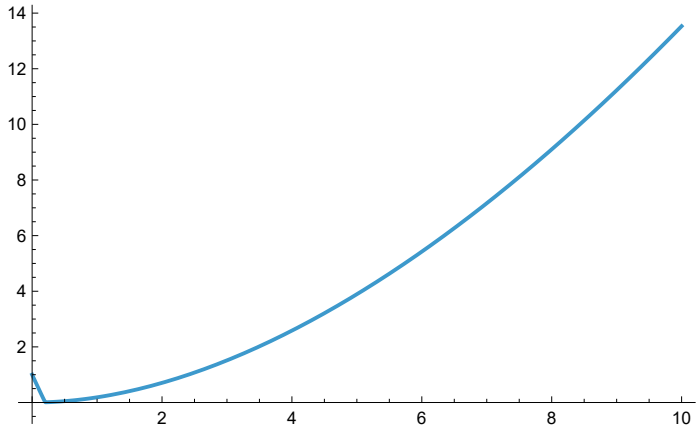
- Problem : Solve the non-linear ordinary differential equation $y\frac{dy}{dx} + 5y = x^2$ with with initial value $y(0)=1$.
- SOLUTION: Our x values are from $x = 0$ to $x= 10$ with plot of the solutions.

In[244]:=

```
sol = NDSolve[{y[x] * y'[x] + 5 * y[x] == x^2,
    y[0] == 1}, y, {x, 0, 10}];
Plot[y[x] /. sol, {x, 0, 10}]
```

Out[245]=



- The solutions are given below:

In[239]:=

```
sol = NDSolve[{y[x] * y'[x] + 5 * y[x] == x^2,
    y[0] == 1}, y, {x, 0, 10}];
Table[{x, y[x] /. sol[[1]]},
  {x, 0, 10, 0.1}] // TableForm
Plot[y[x] /. sol, {x, 0, 10}]
```

Out[240]//TableForm=

```
0.     1.
0.1    0.500545
0.2    0.0221314
0.3    0.0175919
0.4    0.0310496
```

0.5	0.0481755
0.6	0.0688994
0.7	0.0931557
0.8	0.120882
0.9	0.15202
1.	0.186514
1.1	0.22431
1.2	0.26536
1.3	0.309614
1.4	0.357027
1.5	0.407556
1.6	0.461157
1.7	0.517792
1.8	0.577422
1.9	0.640009
2.	0.705519
2.1	0.773916
2.2	0.845167
2.3	0.919241
2.4	0.996107
2.5	1.07573
2.6	1.15809
2.7	1.24316
2.8	1.3309
2.9	1.4213
3.	1.51432
3.1	1.60994
3.2	1.70814
3.3	1.8089
3.4	1.91218
3.5	2.01798
3.6	2.12626
3.7	2.23701
3.8	2.35021
3.9	2.46583
4.	2.58386
4.1	2.70428
4.2	2.82707
4.3	2.95221
4.4	3.07969
4.5	3.20948
4.6	3.34157
4.7	3.47594
4.8	3.61258
4.9	3.75148
5.	3.89261
5.1	4.03596
5.2	4.18152
5.3	4.32927
5.4	4.47919
5.5	4.63128
5.6	4.78552
5.7	4.9419

```
5.8    5.1004
5.9    5.26101
6.     5.42371
6.1    5.58851
6.2    5.75537
6.3    5.9243
6.4    6.09527
6.5    6.26829
6.6    6.44332
6.7    6.62038
6.8    6.79944
6.9    6.98049
7.     7.16352
7.1    7.34853
7.2    7.53549
7.3    7.72441
7.4    7.91527
7.5    8.10806
7.6    8.30278
7.7    8.4994
7.8    8.69793
7.9    8.89835
8.     9.10066
8.1    9.30484
8.2    9.51089
8.3    9.7188
8.4    9.92855
8.5    10.1401
8.6    10.3536
8.7    10.5688
8.8    10.7859
8.9    11.0048
9.     11.2255
9.1    11.4479
9.2    11.6722
9.3    11.8982
9.4    12.126
9.5    12.3556
9.6    12.5869
9.7    12.8199
9.8    13.0548
9.9    13.2913
10.    13.5295
```

Out[241]=