Find the solutions of $\left(\frac{dy}{dx}\right)^2 + y = 0$.

- SOLUTION: $\frac{dy}{dx} = \sqrt{-y} \Rightarrow \frac{dy}{\sqrt{-y}} = dx \Rightarrow 2\sqrt{y} = ix + c$

$y = \frac{-1}{4} x^2$

- i= square root of -1
- By Mathematica we have

In[78]:=
```
sol = DSolve[(y'[x])^2 + y[x] == 0, y[x], x]
```

Out[78]=

$$\left\{\left\{y[x] \to \frac{1}{4}\left(-x^2 - 2\,i\,x\,C_1 + C_1^2\right)\right\}, \left\{y[x] \to \frac{1}{4}\left(-x^2 + 2\,i\,x\,C_1 + C_1^2\right)\right\}\right\}$$

In[76]:=
```
{{y[x] → 1/4 (-x^2 - 2 i x C[1] + C[1]^2)}, {y[x] → 1/4 (-x^2 + 2 i x C[1] + C[1]^2)}}
```

Out[76]=

$$\left\{\left\{y[x] \to \frac{1}{4}\left(-x^2 - 2\,i\,x\,C_1 + C_1^2\right)\right\}, \left\{y[x] \to \frac{1}{4}\left(-x^2 + 2\,i\,x\,C_1 + C_1^2\right)\right\}\right\}$$

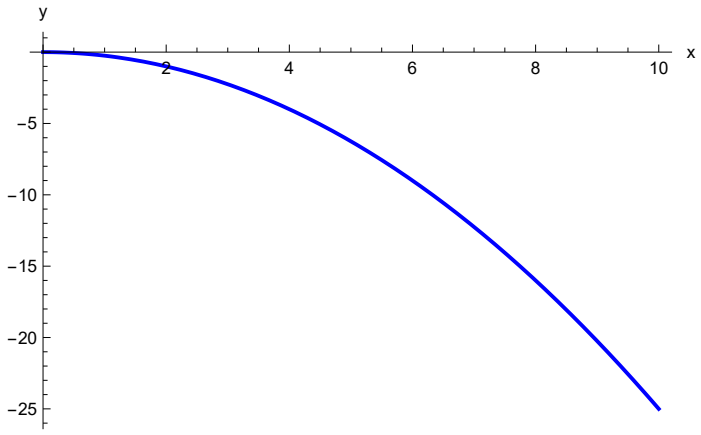
```
specificSol =
 sol /. C[1] → 0 (* Let the constant C
    of integration be equal to 0 *)
```

Out[77]=

$$\left\{\left\{y[x] \to -\frac{x^2}{4}\right\}, \left\{y[x] \to -\frac{x^2}{4}\right\}\right\}$$

In[83]:=
```
Plot[-(x^2) / 4, {x, 0, 10}, PlotRange → All,
 AxesLabel → {"x", "y"}, PlotStyle → Blue]
```

Out[83]=



In[81]:=
```
Table[{x, -(x^2) / 4}, {x, 0, 10}] // N
```

Out[81]=
```
{{0., 0.}, {1., -0.25}, {2., -1.}, {3., -2.25},
 {4., -4.}, {5., -6.25}, {6., -9.}, {7., -12.25},
 {8., -16.}, {9., -20.25}, {10., -25.}}
```

In[82]:=
```
Grid[Table[{x, -(x^2) / 4},
  {x, 0, 10}], Frame → All]
```

Out[82]=

0	0
1	$-\frac{1}{4}$
2	-1
3	$-\frac{9}{4}$
4	-4
5	$-\frac{25}{4}$
6	-9
7	$-\frac{49}{4}$
8	-16
9	$-\frac{81}{4}$
10	-25