

# Harshit Sahu | BSc (Hons) Computer Science | 2021 | 4 | 4 | Practical – 5

**Problem – I :**

$$x'[t] + y'[t] - x[t] = -2 * t$$

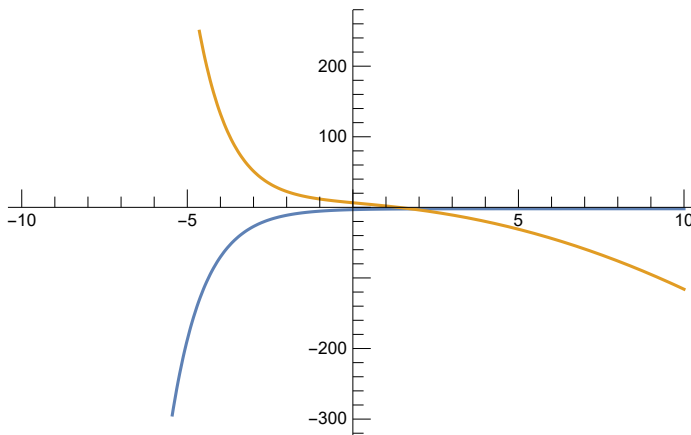
$$x'[t] + y'[t] - 3 x[t] - y[t] = t * t$$

**SOL:**

```
In[115]:= sol1 =
  DSolve[{x'[t] + y'[t] - x[t] == -2 * t, x'[t] + y'[t] - 3 * x[t] - y[t] == t * t}, {x, y}, t]
particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] -> 5}
Plot[Evaluate[particularsol], {t, -10, 10}]
```

```
Out[115]= {{x -> Function[{t}, -2 t - t^2 + 1/4 (4 (-2 + 2 t + t^2) - e^-t C[1])],
  y -> Function[{t}, 2 t + t^2 + 1/2 (-4 (-2 + 2 t + t^2) + e^-t C[1])]}}
```

```
Out[116]= {-2 t - t^2 + 1/4 (-5 e^-t + 4 (-2 + 2 t + t^2)), 2 t + t^2 + 1/2 (5 e^-t - 4 (-2 + 2 t + t^2))}
```



**Problem – 2 :**

$$x'[t] + y'[t] - 2 * x[t] - 4 * y[t] = \text{Exp}[t]$$

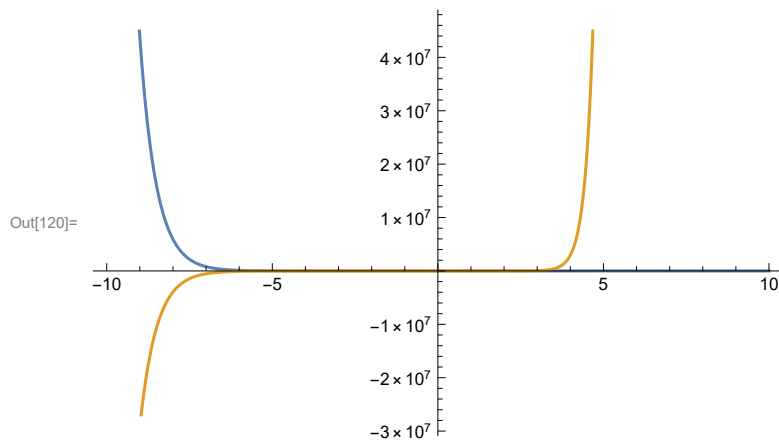
$$x'[t] + y'[t] - y[t] = \text{Exp}[4 * t]$$

**SOL :**

```
In[118]:= sol1 = DSolve[
  {x'[t] + y'[t] - 2 * x[t] - 4 * y[t] == Exp[t], x'[t] + y'[t] - y[t] == Exp[4 * t]}, {x, y}, t]
particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] -> 2}
Plot[Evaluate[particularsol], {t, -10, 10}]
```

```
Out[118]= {{x -> Function[{t}, -e^t (-1 + e^3 t) + 1/3 (3 e^t (-1 + e^3 t) + e^-2 t C[1])],
  y -> Function[{t}, e^t (-1 + e^3 t) - 2/9 (3 e^t (-1 + e^3 t) + e^-2 t C[1])]}}
```

```
Out[119]= {-e^t (-1 + e^3 t) + 1/3 (2 e^-2 t + 3 e^t (-1 + e^3 t)), e^t (-1 + e^3 t) - 2/9 (2 e^-2 t + 3 e^t (-1 + e^3 t))}
```

**Problem – 3 :**

$$x'[t] + y'[t] + 4 * y[t] = \text{Sin}[t]$$

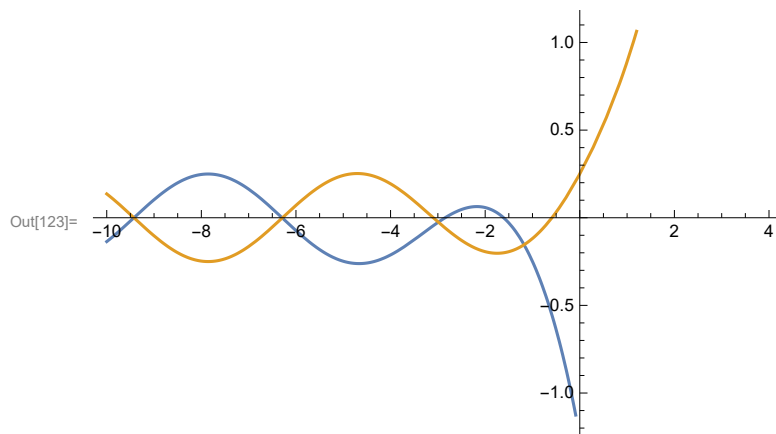
$$x'[t] + y'[t] - x[t] - y[t] = 0$$

**SOL :**

```
In[121]:= sol1 =
  DSolve[{x'[t] + y'[t] + 4 * y[t] == Sin[t], x'[t] + y'[t] - x[t] - y[t] == 0}, {x, y}, t]
  particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] → -1}
  Plot[Evaluate[particularsol], {t, -10, 4}]
```

```
Out[121]= {{x → Function[{t},  $\frac{5}{4} e^t C[1] - \frac{\text{Sin}[t]}{4}$ ], y → Function[{t},  $-\frac{1}{4} e^t C[1] + \frac{\text{Sin}[t]}{4}$ ]}}
```

```
Out[122]= {- $\frac{5 e^t}{4} - \frac{\text{Sin}[t]}{4}$ ,  $\frac{e^t}{4} + \frac{\text{Sin}[t]}{4}$ }
```



#### Problem – 4 :

$$2 * x'[t] + 4 * y'[t] + x[t] - y[t] = 3 * \text{Exp}[t]$$

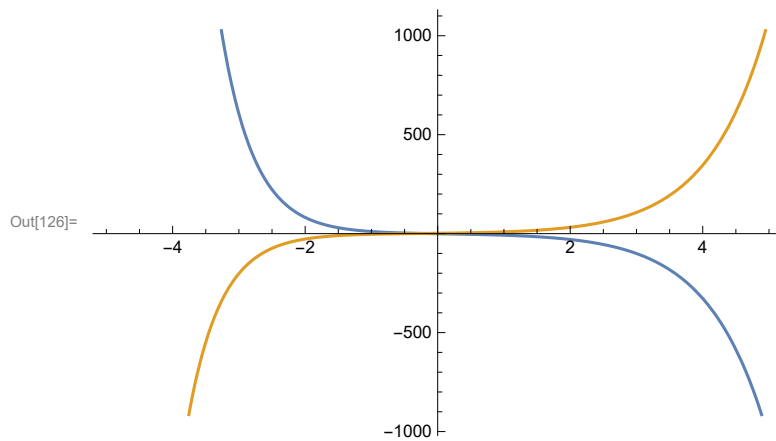
$$x'[t] + y'[t] + 2 * x[t] + 2 * y[t] = \text{Exp}[t]$$

**SOL :**

```
In[124]:= sol1 = DSolve[{2 * x'[t] + 4 * y'[t] + x[t] - y[t] == 3 * Exp[t],
  x'[t] + y'[t] + 2 * x[t] + 2 * y[t] == Exp[t]}, {x, y}, t]
particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] → -1, C[2] → 2}
Plot[Evaluate[particularsol], {t, -5, 5}]
```

```
Out[124]= {{x → Function[{t}, - $\frac{1}{2} e^{-2t} (-3 + e^{3t}) \left(\frac{e^{3t}}{2} - t\right) -$ 
 $\frac{3}{2} e^{-2t} (-1 + e^{3t}) \left(-\frac{e^{3t}}{6} + t\right) - \frac{1}{2} e^{-2t} (-3 + e^{3t}) C[1] - \frac{3}{2} e^{-2t} (-1 + e^{3t}) C[2]\right],$ 
y → Function[{t},  $\frac{1}{2} e^{-2t} (-1 + e^{3t}) \left(\frac{e^{3t}}{2} - t\right) + \frac{1}{2} e^{-2t} (-1 + 3 e^{3t}) \left(-\frac{e^{3t}}{6} + t\right) +$ 
 $\frac{1}{2} e^{-2t} (-1 + e^{3t}) C[1] + \frac{1}{2} e^{-2t} (-1 + 3 e^{3t}) C[2]\right]}}$ 
```

```
Out[125]= { $\frac{1}{2} e^{-2t} (-3 + e^{3t}) - 3 e^{-2t} (-1 + e^{3t}) - \frac{1}{2} e^{-2t} (-3 + e^{3t}) \left(\frac{e^{3t}}{2} - t\right) - \frac{3}{2} e^{-2t} (-1 + e^{3t}) \left(-\frac{e^{3t}}{6} + t\right),$ 
 $-\frac{1}{2} e^{-2t} (-1 + e^{3t}) + e^{-2t} (-1 + 3 e^{3t}) +$ 
 $\frac{1}{2} e^{-2t} (-1 + e^{3t}) \left(\frac{e^{3t}}{2} - t\right) + \frac{1}{2} e^{-2t} (-1 + 3 e^{3t}) \left(-\frac{e^{3t}}{6} + t\right)}$ }
```



### Problem – 5 :

$$x''[t] + y'[t] = \text{Exp}[2 * t]$$

$$x'[t] + y'[t] - x[t] - y[t] = 0$$

**SOL :**

```
In[127]:= sol1 = DSolve[{x''[t] + y'[t] == Exp[2 * t], x'[t] + y'[t] - x[t] - y[t] == 0}, {x, y}, t]
particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] → -1, C[2] → 2, C[3] → 2}
Plot[Evaluate[particularsol], {t, -20, 10}]
```

```
Out[127]= {{x → Function[{t}, e^t (-1 + e^t) + 1/2 e^(2 t) (-2 + e^t) (-1 + t) +
1/2 e^t (-2 + e^t) (-1 + e^t - e^t t) - e^t (-1 + t) C[1] + (-1 + e^t) C[2] + (-1 + e^t - e^t t) C[3]],
y → Function[{t}, e^t (1 - e^t) - 1/2 e^(2 t) (-2 + e^t) t + 1/2 e^t (-2 + e^t) (1 + e^t t) +
e^t t C[1] + (1 - e^t) C[2] + (1 + e^t t) C[3]]}}
```

```
Out[128]= {2 (-1 + e^t) + e^t (-1 + e^t) + e^t (-1 + t) +
1/2 e^(2 t) (-2 + e^t) (-1 + t) + 2 (-1 + e^t - e^t t) + 1/2 e^t (-2 + e^t) (-1 + e^t - e^t t),
2 (1 - e^t) + e^t (1 - e^t) - e^t t - 1/2 e^(2 t) (-2 + e^t) t + 2 (1 + e^t t) + 1/2 e^t (-2 + e^t) (1 + e^t t)}
```

