Vivek Gupta | BSC CS HONS | 20211467 | Practical- 5

Problem -1 :

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

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

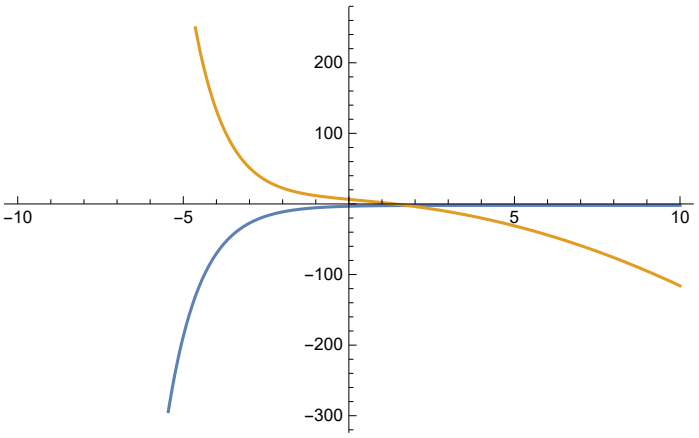
SOL :

In[36]:=
```
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[36]=
$$\left\{\left\{x \to \text{Function}\left[\{t\}, -2t - t^2 + \frac{1}{4}\left(4\left(-2 + 2t + t^2\right) - e^{-t}C[1]\right)\right],\right.\right.$$
$$\left.\left.y \to \text{Function}\left[\{t\}, 2t + t^2 + \frac{1}{2}\left(-4\left(-2 + 2t + t^2\right) + e^{-t}C[1]\right)\right]\right\}\right\}$$

Out[37]=
$$\left\{-2t - t^2 + \frac{1}{4}\left(-5e^{-t} + 4\left(-2 + 2t + t^2\right)\right), 2t + t^2 + \frac{1}{2}\left(5e^{-t} - 4\left(-2 + 2t + t^2\right)\right)\right\}$$

Out[38]=



Problem -2 :

x'[t] + y'[t] - 2*x[t]-4*y[t] =Exp[t]

x'[t] + y'[t] - y[t] =Exp[4*t]

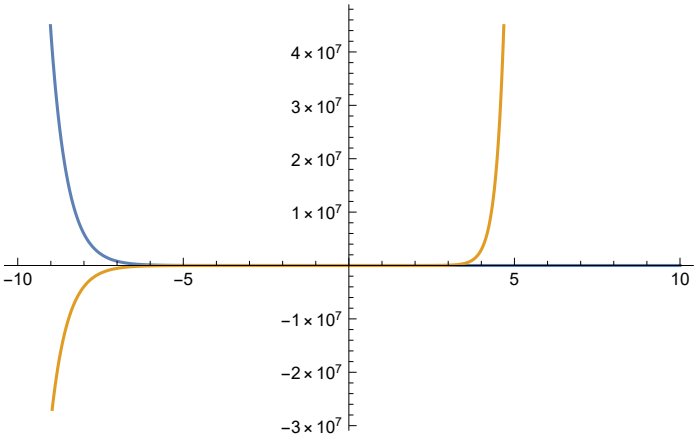
SOL :

In[45]:=
```
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[45]=
$$\left\{\left\{x \to \text{Function}\left[\{t\}, -e^{t}\left(-1+e^{3t}\right)+\frac{1}{3}\left(3e^{t}\left(-1+e^{3t}\right)+e^{-2t}C[1]\right)\right],\right.\right.$$
$$\left.\left.y \to \text{Function}\left[\{t\}, e^{t}\left(-1+e^{3t}\right)-\frac{2}{9}\left(3e^{t}\left(-1+e^{3t}\right)+e^{-2t}C[1]\right)\right]\right\}\right\}$$

Out[46]=
$$\left\{-e^{t}\left(-1+e^{3t}\right)+\frac{1}{3}\left(2e^{-2t}+3e^{t}\left(-1+e^{3t}\right)\right), e^{t}\left(-1+e^{3t}\right)-\frac{2}{9}\left(2e^{-2t}+3e^{t}\left(-1+e^{3t}\right)\right)\right\}$$

Out[47]=



Problem -3 :

x'[t] + y'[t] +4* y[t] = Sin[t]

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

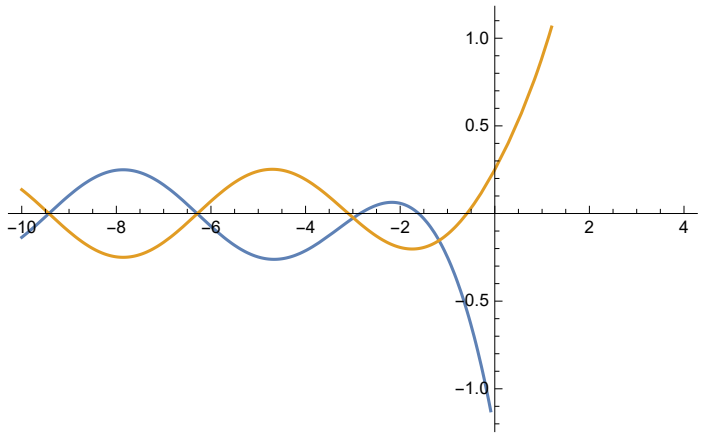
SOL :

In[51]:=
```
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[51]= $\left\{\left\{x \to \text{Function}\left[\{t\}, \frac{5}{4} e^t C[1] - \frac{\text{Sin}[t]}{4}\right], y \to \text{Function}\left[\{t\}, -\frac{1}{4} e^t C[1] + \frac{\text{Sin}[t]}{4}\right]\right\}\right\}$

Out[52]= $\left\{-\frac{5 e^t}{4} - \frac{\text{Sin}[t]}{4}, \frac{e^t}{4} + \frac{\text{Sin}[t]}{4}\right\}$

Out[53]=



Problem -4 :

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]

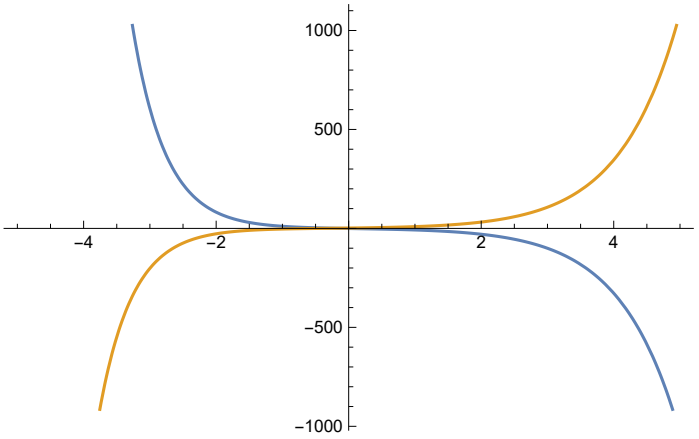
SOL:

In[54]:=
```
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[54]=
$$\left\{\left\{x \to \text{Function}\left[\{t\}, -\frac{1}{2} e^{-2t}\left(-3+e^{3t}\right)\left(\frac{e^{3t}}{2}-t\right)-\right.\right.\right.$$
$$\left.\frac{3}{2} e^{-2t}\left(-1+e^{3t}\right)\left(-\frac{e^{3t}}{6}+t\right)-\frac{1}{2} e^{-2t}\left(-3+e^{3t}\right) C[1]-\frac{3}{2} e^{-2t}\left(-1+e^{3t}\right) C[2]\right],$$
$$y \to \text{Function}\left[\{t\}, \frac{1}{2} e^{-2t}\left(-1+e^{3t}\right)\left(\frac{e^{3t}}{2}-t\right)+\frac{1}{2} e^{-2t}\left(-1+3 e^{3t}\right)\left(-\frac{e^{3t}}{6}+t\right)+\right.$$
$$\left.\left.\frac{1}{2} e^{-2t}\left(-1+e^{3t}\right) C[1]+\frac{1}{2} e^{-2t}\left(-1+3 e^{3t}\right) C[2]\right]\right\}\right\}$$

Out[55]=
$$\left\{\frac{1}{2} e^{-2t}\left(-3+e^{3t}\right)-3 e^{-2t}\left(-1+e^{3t}\right)-\frac{1}{2} e^{-2t}\left(-3+e^{3t}\right)\left(\frac{e^{3t}}{2}-t\right)-\frac{3}{2} e^{-2t}\left(-1+e^{3t}\right)\left(-\frac{e^{3t}}{6}+t\right),\right.$$
$$-\frac{1}{2} e^{-2t}\left(-1+e^{3t}\right)+e^{-2t}\left(-1+3 e^{3t}\right)+$$
$$\left.\frac{1}{2} e^{-2t}\left(-1+e^{3t}\right)\left(\frac{e^{3t}}{2}-t\right)+\frac{1}{2} e^{-2t}\left(-1+3 e^{3t}\right)\left(-\frac{e^{3t}}{6}+t\right)\right\}$$

Out[56]=



Problem -5 :

x''[t] + y'[t] =Exp[2*t]

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

4

SOL:

In[57]:=
```
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[57]=
$$\left\{\left\{x \to \text{Function}\left[\{t\}, e^t\left(-1+e^t\right)+\frac{1}{2}e^{2t}\left(-2+e^t\right)\left(-1+t\right)+\right.\right.\right.$$
$$\left.\frac{1}{2}e^t\left(-2+e^t\right)\left(-1+e^t-e^t t\right)-e^t\left(-1+t\right)C[1]+\left(-1+e^t\right)C[2]+\left(-1+e^t-e^t t\right)C[3]\right],$$
$$y \to \text{Function}\left[\{t\}, e^t\left(1-e^t\right)-\frac{1}{2}e^{2t}\left(-2+e^t\right)t+\frac{1}{2}e^t\left(-2+e^t\right)\left(1+e^t t\right)+\right.$$
$$\left.\left.e^t t\,C[1]+\left(1-e^t\right)C[2]+\left(1+e^t t\right)C[3]\right]\right\}\right\}$$

Out[58]=
$$\left\{2\left(-1+e^t\right)+e^t\left(-1+e^t\right)+e^t\left(-1+t\right)+\right.$$
$$\frac{1}{2}e^{2t}\left(-2+e^t\right)\left(-1+t\right)+2\left(-1+e^t-e^t t\right)+\frac{1}{2}e^t\left(-2+e^t\right)\left(-1+e^t-e^t t\right),$$
$$\left.2\left(1-e^t\right)+e^t\left(1-e^t\right)-e^t t-\frac{1}{2}e^{2t}\left(-2+e^t\right)t+2\left(1+e^t t\right)+\frac{1}{2}e^t\left(-2+e^t\right)\left(1+e^t t\right)\right\}$$

Out[59]=