JIDHUN PP | BSc(Hons) Computer Science| 20211419|Practical-5
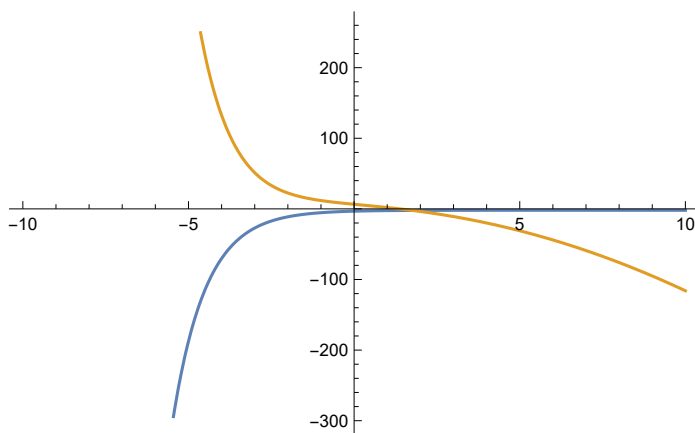
PROBLEM 1:

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

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

SOL:

```
sol1 =
 DSolve[{x'[t] + y'[t] - x[t] == -2 * t, x'[t] + y'[t] - 3 * x[t] - y[t] == t * t}, {x, y}, t]
```

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

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

```
particularsol = {x[t], y[t]} /. sol1〚1〛 /. {C[1] → 5}
```

$$\left\{-2 t - t^2 + \frac{1}{4} \left(-5 e^{-t} + 4 \left(-2 + 2 t + t^2\right)\right), 2 t + t^2 + \frac{1}{2} \left(5 e^{-t} - 4 \left(-2 + 2 t + t^2\right)\right)\right\}$$

```
Plot[Evaluate[particularsol], {t, -10, 10}]
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PROBLEM 2:

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

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]**

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

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

particularsol = {x[t], y[t]} /. sol1〚1〛 /. {C[1] → 2}

$$\left\{-e^t\left(-1+e^{3t}\right)+\frac{1}{3}\left(2\,e^{-2t}+3\,e^t\left(-1+e^{3t}\right)\right), \; e^t\left(-1+e^{3t}\right)-\frac{2}{9}\left(2\,e^{-2t}+3\,e^t\left(-1+e^{3t}\right)\right)\right\}$$

Plot[Evaluate[particularsol], {t, -10, 10}]
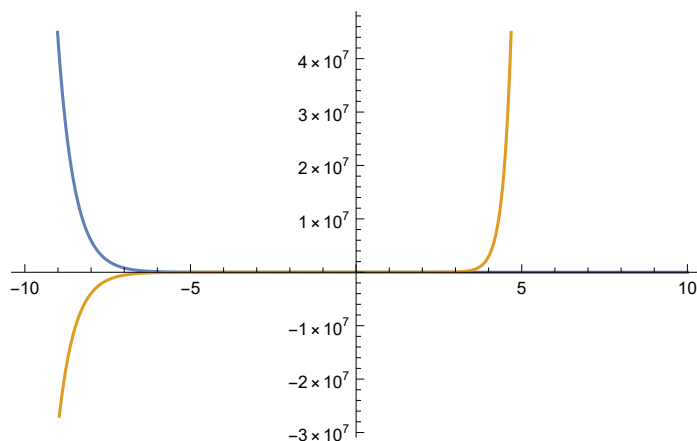
PROBLEM 3:
x'[t]+y'[t]+4*y[t]=Sin[t]
x'[t]+y'[t]-x[t]-y[t]=0
SOL:

sol1 =
** DSolve[{x'[t] + y'[t] + 4 * y[t] == Sin[t], x'[t] + y'[t] - x[t] - y[t] == 0}, {x, y}, t]**

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

particularsol = {x[t], y[t]} /. sol1〚1〛 /. {C[1] → -1}

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

```
Plot[Evaluate[particularsol], {t, -10, 4}]
```
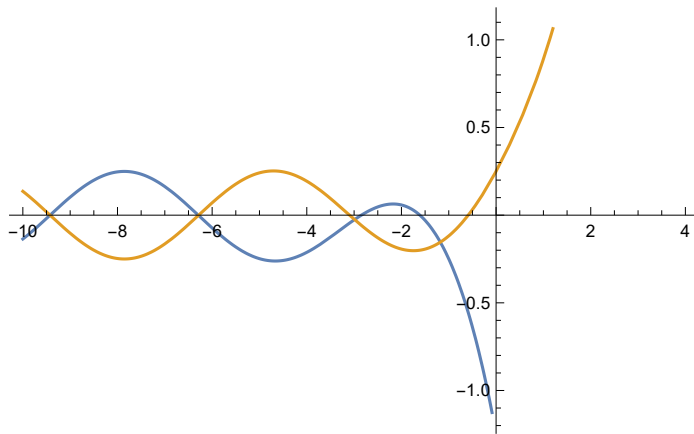

PROBLEM 4:
2*x'[t]+4*y'[t]+x[t]-y[t]=3Exp[t]
x'[t]+y'[t]+2*x[t]+2*y[t]=Exp[t]
SOL:

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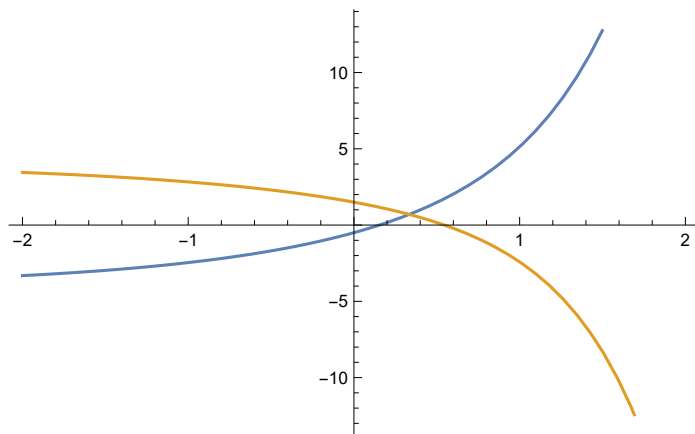
$$\left\{\left\{x \to \text{Function}\left[\{t\}, -\frac{1}{2} e^{-2t} \left(-3 + e^{3t}\right) \left(\frac{e^{3t}}{2} - t\right) - \right.\right.\right.$$

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

$$y \to \text{Function}\left[\{t\}, \frac{1}{2} e^{-2t} \left(-1 + e^{3t}\right) \left(\frac{e^{3t}}{2} - t\right) + \frac{1}{2} e^{-2t} \left(-1 + 3 e^{3t}\right) \left(-\frac{e^{3t}}{6} + t\right) + \right.$$

$$\left.\left.\left.\frac{1}{2} e^{-2t} \left(-1 + e^{3t}\right) C[1] + \frac{1}{2} e^{-2t} \left(-1 + 3 e^{3t}\right) C[2]\right]\right\}\right\}$$

```
particularsol = {x[t], y[t]} /. sol1〚1〛 /. {C[1] → -1, C[2] → 2}
```

$$\left\{\frac{1}{2} e^{-2t} \left(-3 + e^{3t}\right) - 3 e^{-2t} \left(-1 + e^{3t}\right) - \frac{1}{2} e^{-2t} \left(-3 + e^{3t}\right) \left(\frac{e^{3t}}{2} - t\right) - \right.$$

$$\frac{3}{2} e^{-2t} \left(-1 + e^{3t}\right) \left(-\frac{e^{3t}}{6} + t\right), -\frac{1}{2} e^{-2t} \left(-1 + e^{3t}\right) + e^{-2t} \left(-1 + 3 e^{3t}\right) +$$

$$\left.\frac{1}{2} e^{-2t} \left(-1 + e^{3t}\right) \left(\frac{e^{3t}}{2} - t\right) + \frac{1}{2} e^{-2t} \left(-1 + 3 e^{3t}\right) \left(-\frac{e^{3t}}{6} + t\right)\right\}$$

```
Plot[Evaluate[particularsol], {t, -2, 2}]
```


PROBLEM 5:
x''[t]+y'[t]=Exp[2*t]
x'[t]+y'[t]-x[t]-y[t]=0
SOL:

```
sol1 = DSolve[{x''[t] + y'[t] == Exp[2 * t], x'[t] + y'[t] - x[t] - y[t] == 0}, {x, y}, t]
```

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

```
particularsol = {x[t], y[t]} /. sol1[[1]] /. {C[1] → -1, C[2] → 2, C[3] → 2}
```

$$\left\{2\left(-1 + e^t\right) + e^t\left(-1 + e^t\right) + e^t(-1 + t) + \right.$$
$$\frac{1}{2} e^{2t}\left(-2 + e^t\right)(-1 + t) + 2\left(-1 + e^t - e^t t\right) + \frac{1}{2} e^t\left(-2 + e^t\right)\left(-1 + e^t - e^t t\right),$$
$$\left. 2\left(1 - e^t\right) + e^t\left(1 - e^t\right) - e^t t - \frac{1}{2} e^{2t}\left(-2 + e^t\right) t + 2\left(1 + e^t t\right) + \frac{1}{2} e^t\left(-2 + e^t\right)\left(1 + e^t t\right)\right\}$$

Plot[Evaluate[particularsol], {t, -20, 10}]