JIDHUN PP | BSc(Hons) Computer Science| 20211419|Practical-3

Plotting third order solution family of differential Equation

Question 1:Solve third order Differential Equation y’’’-5y’’+8y’-4y=0 and Plot its three solution

Solution:

```
Sol = DSolve[y'''[x] - 5 y''[x] + 8 y'[x] - 4 y[x] == 0, y[x], x]
```

$$\{\{y[x] \to e^{x} C[1] + e^{2x} C[2] + e^{2x} x C[3]\}\}$$

```
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0.5, C[3] → 2 / 3}
```

$$e^{x} + 0.5\, e^{2x} + \frac{2}{3} e^{2x} x$$

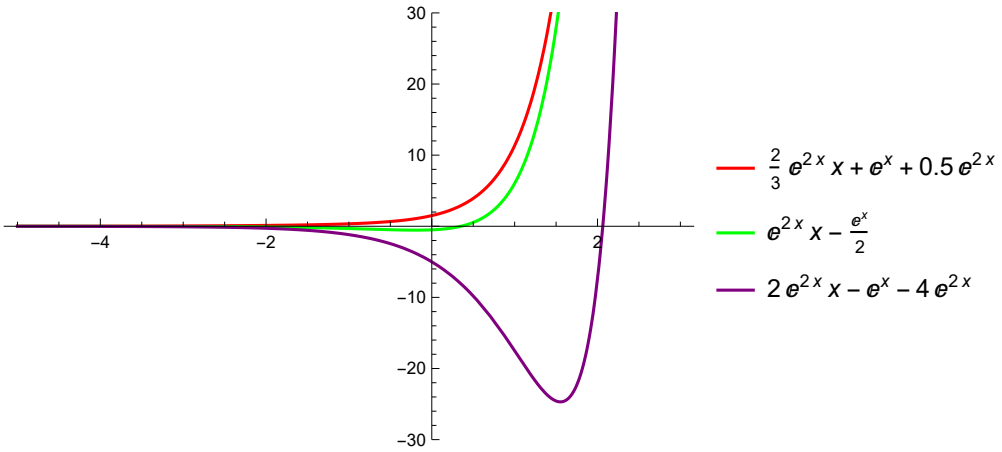
```
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -1 / 2, C[2] → 0, C[3] → 1}
```

$$-\frac{e^{x}}{2} + e^{2x} x$$

```
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}
```

$$-e^{x} - 4\, e^{2x} + 2\, e^{2x} x$$

```
Plot[{Sol1, Sol2, Sol3}, {x, -5, 3}, PlotRange → {-30, 30},
 PlotStyle → {{Red}, {Green}, {Purple}},
 PlotLegends → {Sol1, Sol2, Sol3}]
```



Question 2:Solve third order Differential Equation y’’’+3y’’-25y’+21y=0 and Plot its any four solution

Solution:

```
Eqn = y'''[x] + 3 * y''[x] - 25 * y'[x] + 21 * y[x]
Sol = DSolve[Eqn == 0, y[x], x]
```

$$21\, y[x] - 25\, y'[x] + 3\, y''[x] + y^{(3)}[x]$$

$$\left\{\left\{y[x] \to e^{-7x} C[1] + e^{x} C[2] + e^{3x} C[3]\right\}\right\}$$

```
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}
```

$$e^{-7x} + 2\, e^{3x}$$

```
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -1 / 2, C[2] → 0, C[3] → 1}
```

$$-\frac{1}{2} e^{-7x} + e^{3x}$$

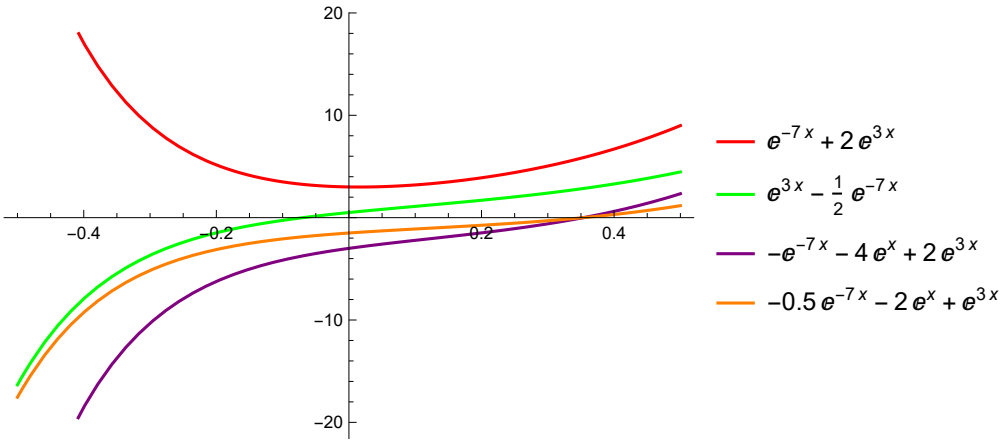
```
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}
```

$$-e^{-7x} - 4\, e^{x} + 2\, e^{3x}$$

```
Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}
```

$$-0.5\, e^{-7x} - 2\, e^{x} + e^{3x}$$

```
Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5, 0.5},
 PlotStyle → {{Red}, {Green}, {Purple}, {Orange}},
 PlotLegends → {Sol1, Sol2, Sol3, Sol4}]
```



Question 3:Solve third order Differential Equation y’’’-4y’’-25y’+28y=0 and Plot its any four solution

Solution:

```
Eqn = y'''[x] - 4 * y''[x] - 25 * y'[x] + 28 * y[x]
Sol = DSolve[Eqn == 0, y[x], x]
```

$28\,y[x] - 25\,y'[x] - 4\,y''[x] + y^{(3)}[x]$

$\{\{y[x] \to e^{-4x}\,C[1] + e^{x}\,C[2] + e^{7x}\,C[3]\}\}$

```
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}
```

$e^{-4x} + 2\,e^{7x}$

```
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -2, C[2] → 10, C[3] → 3}
```

$-2\,e^{-4x} + 10\,e^{x} + 3\,e^{7x}$

```
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 20}
```

$-e^{-4x} - 4\,e^{x} + 20\,e^{7x}$

```
Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}
```

$-0.5\,e^{-4x} - 2\,e^{x} + e^{7x}$

```
Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5, 0.5},
 PlotStyle → {{Red}, {Green}, {Purple}, {Orange}},
 PlotLegends → {Sol1, Sol2, Sol3, Sol4}]
```