Rahul Chopra | Bsc.(Hons) Computer Science | 20211449 | Practical – 3

Plotting third order solution family of Differential Equation.

Question 1 :

Solve third order Differential Equation y''' – 5 y'' + 8 y' – 4 y = 0 and Plot its three Solutions.

Solution :

```
In[1]:= Sol = DSolve[y'''[x] - 5 y''[x] + 8 y'[x] - 4 y[x] == 0, y[x], x]
Out[1]= {{y[x] → ℯ^x C[1] + ℯ^(2 x) C[2] + ℯ^(2 x) x C[3]}}

In[2]:= Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0.5, C[3] → 2/3}
Out[2]= ℯ^x + 0.5 ℯ^(2 x) + (2/3) ℯ^(2 x) x
```

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

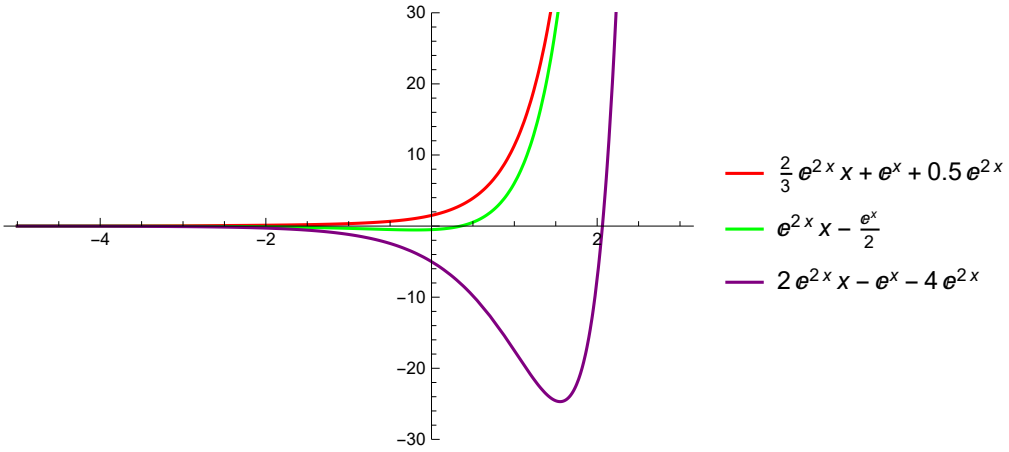
Out[3]= $-\frac{e^x}{2} + e^{2x} x$

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

Out[4]= $-e^x - 4\, e^{2x} + 2\, e^{2x} x$

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

Out[5]=



Question 2 :

Solve third order Differential Equation y''' + 3 y'' – 25 y' + 21 y = 0 and Plot its any four Solutions.Solution :

In[6]:=
```
Eqn = y'''[x] + 3 * y''[x] - 25 * y'[x] + 21 * y[x]
Sol = DSolve[Eqn == 0, y[x], x]
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -1/2, C[2] → 0, C[3] → 1}
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}
Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}
Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5, 0.5},
 PlotStyle → {{Red}, {Green}, {Purple}, {Orange}},
 PlotLegends → {Sol1, Sol2, Sol3, Sol4}]
```

Out[6]= $21\,y[x] - 25\,y'[x] + 3\,y''[x] + y^{(3)}[x]$

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

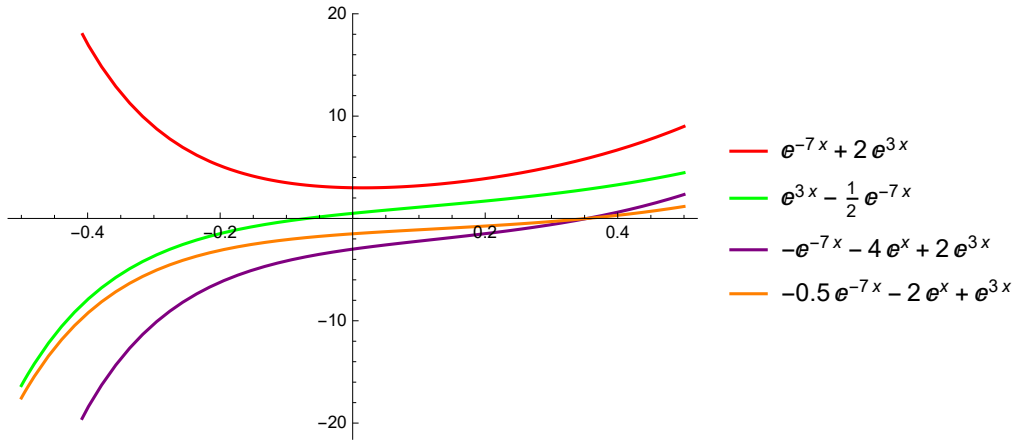
Out[8]= $e^{-7x} + 2\,e^{3x}$

Out[9]= $-\frac{1}{2}e^{-7x} + e^{3x}$

Out[10]= $-e^{-7x} - 4\,e^{x} + 2\,e^{3x}$

Out[11]= $-0.5\,e^{-7x} - 2\,e^{x} + e^{3x}$

Out[12]=



Question 3 :

Solve third order Differential Equation y''' – 4 y'' – 25 y' + 28 y = 0 and

Plot its any four Solutions.

In[20]:=
```
Eqn = y'''[x] - 4 * y''[x] - 25 * y'[x] + 28 * y[x]
Sol = DSolve[Eqn == 0, y[x], x]
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 1, C[2] → 0, C[3] → 2}
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -2, C[2] → 10, C[3] → 3}
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 20}
Sol4 = y[x] /. Sol[[1]] /. {C[1] → -0.5, C[2] → -2, C[3] → 1}
Plot[{Sol1, Sol2, Sol3, Sol4}, {x, -0.5, 0.5},
 PlotStyle → {{Red}, {Green}, {Purple}, {Orange}},
 PlotLegends → {Sol1, Sol2, Sol3, Sol4}]
```

Out[20]= $28\,y[x] - 25\,y'[x] - 4\,y''[x] + y^{(3)}[x]$

Out[21]= $\left\{\left\{y[x] \to e^{-4x}\,C[1] + e^{x}\,C[2] + e^{7x}\,C[3]\right\}\right\}$

Out[22]= $e^{-4x} + 2\,e^{7x}$

Out[23]= $-2\,e^{-4x} + 10\,e^{x} + 3\,e^{7x}$

Out[24]= $-e^{-4x} - 4\,e^{x} + 20\,e^{7x}$

Out[25]= $-0.5\,e^{-4x} - 2\,e^{x} + e^{7x}$

Out[26]=