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BSC CS HONS |

20 211467 | 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 Solutions.

Solution :

In[24]:=
```
Sol=DSolve[y '''[x] -5 y ''[x] +8 y'[x] -4 y[x] ==0, y[x], x]
Sol1=y[x] /. Sol [1] /.·C[1]→1, C[2]→0.5, C[3]→2·3·
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}
Plot[{Sol1, Sol2, Sol3},{x,-5, 3}, PlotRange→{-30, 30},
 PlotStyle→{{Red},{Green},{Purple}}, PlotLegends→{Sol1, Sol2, Sol3}]
```

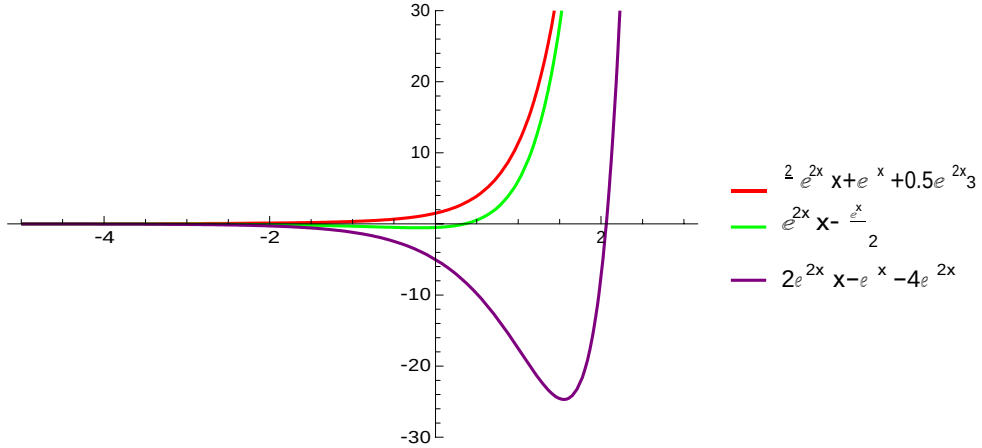
Out[24]= $\cdot\cdot y[x]\to e^{x} C[1]+e^{2 x} C[2]+e^{2 x} x\, C[3]\cdot\cdot$

Out[25]= $e^{x}+0.5 e^{2 x}+\frac{2}{3} e^{2 x} x$

Out[26]= $-\frac{e^{x}}{2}+e^{2 x} x 2$

Out[27]= $-e^{x}-4 e^{2 x}+2 e^{2 x} x$

Out[28]=



Question 2: Solve third order Differential Equation y''' + 3y'' - 25y' + 21y = 0 and

Plot its any four Solutions.

Solution :

In[50]:=
```
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[50]= $21\,y[x]-25\,y'[x]+3\,y''[x]+y^{(3)}[x]$ Out[51]=

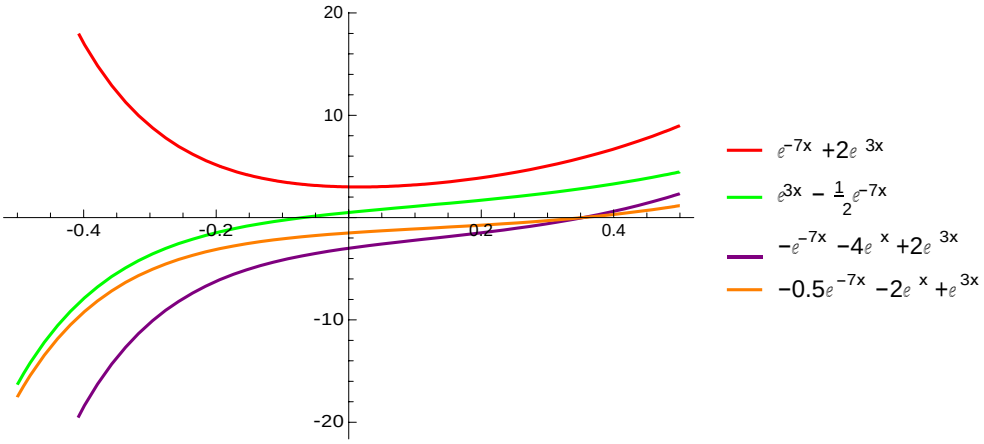
$\{\{y[x]\to e^{-7x}C[1]+e^{x}C[2]+e^{3x}C[3]\}\}$ Out[52]= $e^{-7x}+2e^{3x}$

Out[53]= $-\frac{1}{2}e^{-7x}+e^{3x}$

Out[54]= $-e^{-7x}-4e^{x}+2e^{3x}$

Out[55]= $-0.5e^{-7x}-2e^{x}+e^{3x}$

Out[56]=



Question 3: Solve third order Differential Equation y’’’ - 4y’’ - 25y’ + 28y = 0 and

Plot its any four Solutions.

Solution :

In[57]:=
```
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[57]= $28\,y[x]-25\,y'[x]-4\,y''[x]+y^{(3)}[x]$ Out[58]=

$$\{\{y[x]\to e^{-4x}C[1]+e^{x}C[2]+e^{7x}C[3]\}\}$$ Out[59]= $e^{-4x}+2e^{7x}$

Out[60]= $-2e^{-4x}+10e^{x}+3e^{7x}$

Out[61]= $-e^{-4x}-4e^{x}+20e^{7x}$

Out[62]= $-0.5e^{-4x}-2e^{x}+e^{7x}$

Out[63]=