Practical-3

Ploting of Third order solution family of differential equation.

Question 1: Solve third order differential equation d^3y/dx^2-5d^2y-/dx^2+8dy/dx-4y=0
and plot its any three solutions.

Solution:

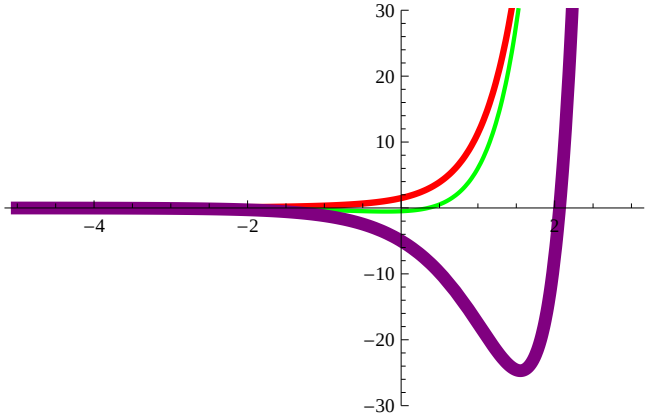
```
sol = DSolve[y'''[x] - 5 y''[x] + 8 y'[x] - 4 y[x] == 0, y[x], x]
sol1 = Evaluate[
   y[x] /. sol[[1]] /. {C[1] → 1, C[2] → 0.5, C[3] → 2 / 3}]
sol2 = y[x] /. sol[[1]] /. {C[1] → -1 / 2, C[2] → 0, C[3] → 1}
sol3 = y[x] /. sol[[1]] /. {C[1] → -1, C[2] → -4, C[3] → 2}
Plot[{sol1, sol2, sol3}, {x, -5, 3}, PlotRange → {-30, 30},
 PlotStyle → {{Red, Thickness[0.01]},
    {Green, Thick}, {Purple, Thickness[0.02]}}]
```

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

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

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

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



Question 2: Solve third order differential equation d^3y/dx^3+3d^2y/dx^2-25d/dx+21y=0 and plot its any four solutions.

Solution:

```
eqn = y'''[x] + 3 * y''[x] - 25 * y'[x] + 21 * y[x];
sol = DSolve[eqn == 0, y[x], x]
sol1 =
 Evaluate[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, Thickness[0.01]}, {Green, Thick},
   {Purple, Thickness[0.02]}, {Orange, Thickness[0.01]}}]
```

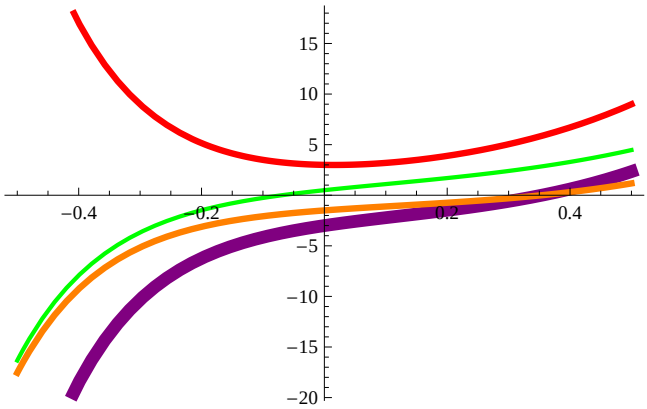
$$\left\{\left\{y[x] \to e^{-7x} C[1] + e^{x} C[2] + e^{3x} C[3]\right\}\right\}$$

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

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

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

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



Question 3: Solve third order differential equation (d^3y)/dx^3-4d^2/dx^2-25dy/dx+28y=0 and plot its any four solutions

Solution:

```
eqn = y'''[x] - 4 * y''[x] - 25 * y'[x] + 28 * y[x]
sol = DSolve[eqn == 0, y[x], x]
sol1 =
 Evaluate[y[x] /. sol[[1]] /. {C[1] → 1, C[2] → 2, 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, Thickness[0.01]}, {Green, Thick},
   {Purple, Thickness[0.02]}, {Orange, Thickness[0.01]}}]
```

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

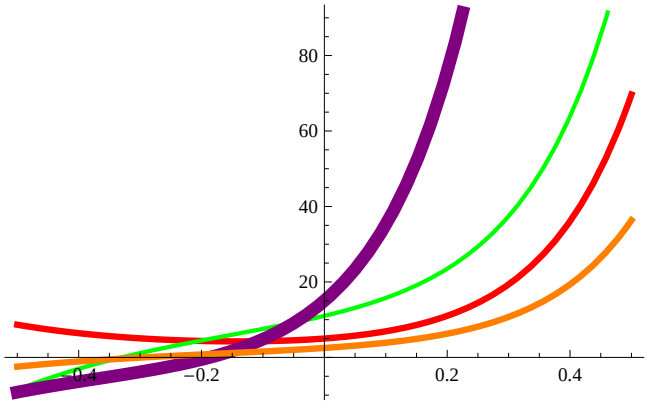
$$\left\{\left\{y[x] \to e^{-4x}\,C[1] + e^{x}\,C[2] + e^{7x}\,C[3]\right\}\right\}$$

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

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

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

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



Question 4: Solve third orer differential equation d^3y/dx^3-13d^2y/dx^2+19dy/dx+33y=cos(2x) and plot its any four dolutions.

Solution:

```
eqn = y'''[x] - 13 * y''[x] + 19 * y'[x] + 33 * y[x];
sol = DSolve[eqn == Cos[2 x], y[x], x]
sol1 =
 Evaluate[y[x] /. sol[[1]] /. {C[1] → 1, C[2] → 2, C[3] → 2}]
sol2 = y[x] /. sol[[1]] /. {C[1] → -2, C[2] → 10, C[3] → 3}
sol3 = y[x] /. sol[[1]] /. {C[1] → -2, C[2] → -6, 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, Thickness[0.01]}, {Green, Thick},
   {Purple, Thickness[0.02]}, {Orange, Thickness[0.01]}}]
```

$$\left\{\left\{y[x] \to e^{-x} C[1] + e^{3x} C[2] + e^{11x} C[3] + \frac{17 \cos[2x] + 6 \sin[2x]}{1625}\right\}\right\}$$

$$e^{-x} + 2 e^{3x} + 2 e^{11x} + \frac{17 \cos[2x] + 6 \sin[2x]}{1625}$$

$$-2 e^{-x} + 10 e^{3x} + 3 e^{11x} + \frac{17 \cos[2x] + 6 \sin[2x]}{1625}$$

$$-2 e^{-x} - 6 e^{3x} + 20 e^{11x} + \frac{17 \cos[2x] + 6 \sin[2x]}{1625}$$

$$-0.5 e^{-x} + 2 e^{3x} + e^{11x} + \frac{17 \cos[2x] + 6 \sin[2x]}{1625}$$