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

Plotting Of First Order Solution Of Family Of Differential Equation

Solving first Order Ordinary Differential Equation : QUES 1 : Solve First Order Differential Equation y'[x] - 6 x^2 - 2 x - 3 = 0. SOL :

In[ ]:=
```
DSolve[y'[x] - 6 x^2 - 2 x - 3 == 0, y[x], x]
```
Out[ ]=

$$\{\{y[x] \to 3x + x^2 + 2x^3 + c_1\}\}$$

QUES 2 : Solve First Order Differential Equation y'[x] -3 x ^ 2 - 2 x - 1 = 0. SOL :

In[ ]:=
```
DSolve[y'[x] - 3 x^2 - 2 x - 1 == 0, y[x], x]
```
Out[ ]=

$$\{\{y[x] \to x + x^2 + x^3 + c_1\}\}$$

QUES 2 : Solve First Order Differential Equation y'[x] - 3 Exp[x - y] - x^2*Exp[-y] = 0 SOL :

In[ ]:=
```
DSolve[y'[x] - 3 Exp[x - y[x]] - x^2 * Exp[-y[x]] == 0, y[x], x]
```

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Out[ ]=

$$\{\{y[x] \to \mathrm{Log}\left[3 e^x + \frac{x^3}{3} + c_1\right]\}\}$$

Plotting of solutions of first order differential equation:

QUES 1: Solve the first order differential equation
y ‘ [x] - 1 - x - y [x] - x *y [x] = 0 and plot its three solutions
SOL :

In[ ]:=
```
Sol = DSolve[y'[x] - 1 - x - y[x] - x * y[x] == 0, y[x], x]
```
Out[ ]=

$$\left\{\left\{y[x] \to -e^{x+\frac{x^2}{2}-\frac{1}{2}x(2+x)} + e^{x+\frac{x^2}{2}} c_1\right\}\right\}$$

In[ ]:=
```
Sol1 = y[x] /. Sol[[1]] /. {C[1] → -10}
```
Out[ ]=

$$-10\, e^{x+\frac{x^2}{2}} - e^{x+\frac{x^2}{2}-\frac{1}{2}x(2+x)}$$

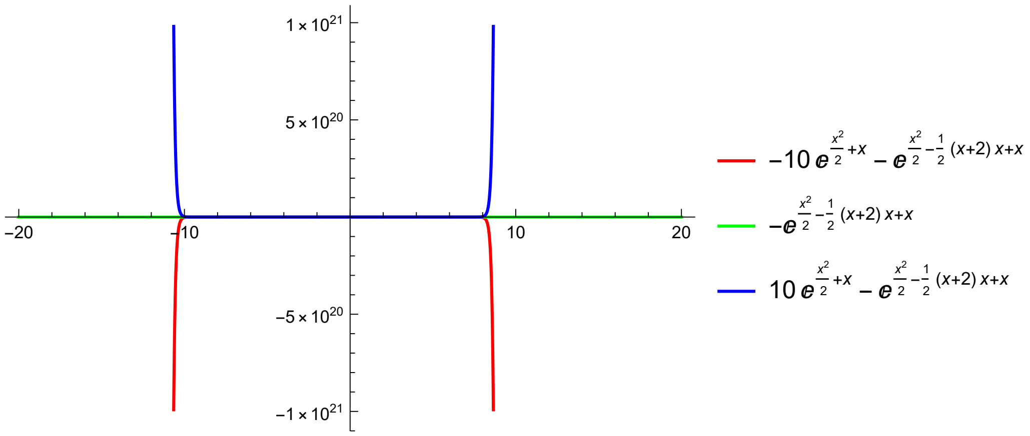
In[ ]:=
```
Sol2 = y[x] /. Sol[[1]] /. {C[1] → -0}
```
Out[ ]=

$$-e^{x+\frac{x^2}{2}-\frac{1}{2}x(2+x)}$$

In[ ]:=
```
Sol3 = y[x] /. Sol[[1]] /. {C[1] → 10}
```
Out[ ]=

$$10\, e^{x+\frac{x^2}{2}} - e^{x+\frac{x^2}{2}-\frac{1}{2}x(2+x)}$$

In[ ]:=
```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
 PlotStyle → {{Red}, {Green}, {Blue}},
 PlotLegends → {Sol1, Sol2, Sol3}]
```
Out[ ]=



QUES 2: Solve the first order differential equation
y ‘[x]-Exp[x-y] - x^2*Exp[-y] = 0 and plot its three solutions
SOL :

In[ ]:=
```
Sol = DSolve[y'[x] - Exp[x - y[x]] - x^2 * Exp[-y[x]] == 0, y[x], x]
```

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Out[ ]=

$$\left\{\left\{y[x] \to \mathrm{Log}\left[e^{x} + \frac{x^3}{3} + c_1\right]\right\}\right\}$$

In[ ]:=
```
Sol1 = y[x] /. Sol[[1]] /. {C[1] → 10}
```

Out[ ]=

$$\mathrm{Log}\left[10 + e^{x} + \frac{x^3}{3}\right]$$

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

Out[ ]=

$$\mathrm{Log}\left[e^{x} + \frac{x^3}{3}\right]$$

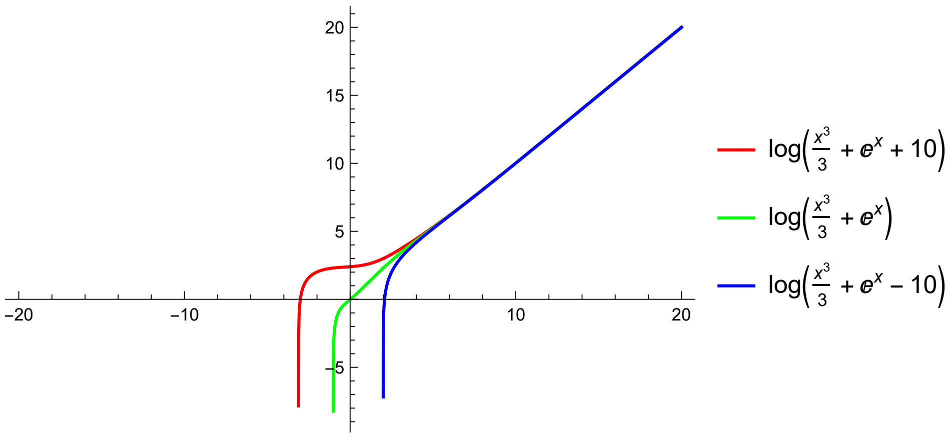
In[ ]:=
```
Sol3 = y[x] /. Sol[[1]] /. {C[1] → -10}
```

Out[ ]=

$$\mathrm{Log}\left[-10 + e^{x} + \frac{x^3}{3}\right]$$

In[ ]:=
```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
 PlotStyle → {{Red}, {Green}, {Blue}},
 PlotLegends → {Sol1, Sol2, Sol3}]
```

Out[ ]=



QUES 3 : Solve the first order differential equation
y ‘[x]*Sin[Pi*x]-y[x]*Cos[Pi*x]=0 and plot its three solutions
SOL :

In[ ]:=
```
Sol = DSolve[y'[x] * Sin[Pi * x] - y[x] * Cos[Pi * x] == 0, y[x], x]
```

Out[ ]=

$$\left\{\left\{y[x] \to c_1\,\mathrm{Sin}[\pi x]^{\frac{1}{\pi}}\right\}\right\}$$

In[ ]:= `Sol1 = y[x] /. Sol[[1]] /. {C[1] → 10}`

Out[ ]=

$10\,\text{Sin}[\pi x]^{\frac{1}{\pi}}$

In[ ]:= `Sol2 = y[x] /. Sol[[1]] /. {C[1] → 5}`

Out[ ]=

$5\,\text{Sin}[\pi x]^{\frac{1}{\pi}}$

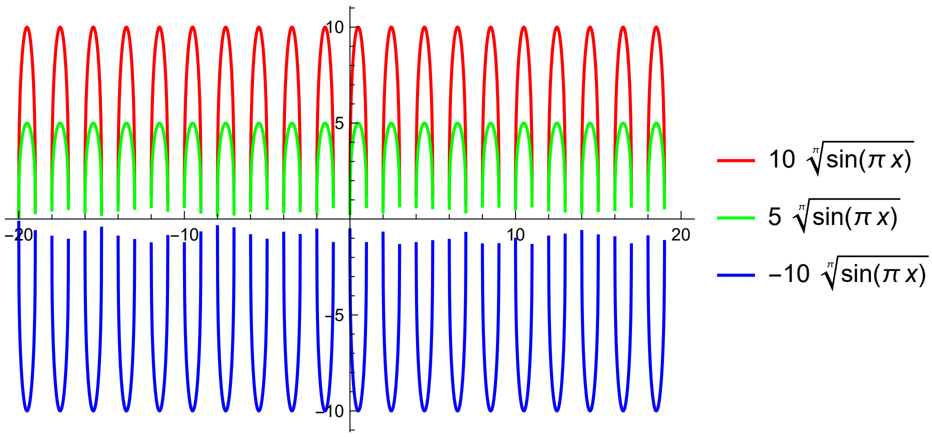
In[ ]:= `Sol3 = y[x] /. Sol[[1]] /. {C[1] → -10}`

Out[ ]=

$-10\,\text{Sin}[\pi x]^{\frac{1}{\pi}}$

In[ ]:=
```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
 PlotStyle → {{Red}, {Green}, {Blue}},
 PlotLegends → {Sol1, Sol2, Sol3}]
```

Out[ ]=



QUES 4 : Solve the first order differential equation y'[x]*(x-1)-2x*y[x]=0 and plot its three solutions
SOL :

In[ ]:= `Sol = DSolve[y'[x] * (x - 1) - 2 x * y[x] == 0, y[x], x]`

Out[ ]=

$\{\{y[x] \to e^{2\,(x+\text{Log}[-1+x])}\, c_1\}\}$

In[ ]:= `Sol1 = y[x] /. Sol[[1]] /. {C[1] → 10}`

Out[ ]=

$10\, e^{2\,(x+\text{Log}[-1+x])}$

In[ ]:= `Sol2 = y[x] /. Sol[[1]] /. {C[1] → 1}`

Out[ ]=

$e^{2\,(x+\text{Log}[-1+x])}$

In[ ]:= `Sol3 = y[x] /. Sol[[1]] /. {C[1] → -10}`

Out[ ]=

$-10\, e^{2\,(x+\text{Log}[-1+x])}$

In[ ]:=
```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
 PlotStyle → {{Red}, {Green}, {Blue}},
 PlotLegends → {Sol1, Sol2, Sol3}]
```

Out[ ]=