

PRACTICAL I

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Plotting Of First Order Solution Of Family Of Differential Equation

Solving First Order Differential Equation :

Ques 1. Solve First Order Differential Equation $y'[x] - 6x^2 - 2x - 3 = 0$?

SOL :


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

`{ {y[x] -> 3 x + x^2 + 2 x^3 + C[1]} }`

Ques 2. Solve First Order Differential Equation $y'[x] - 3 \text{Exp}[x - y] - x^2 * \text{Exp}[-y] = 0$?

SOL :

`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.

`{ {y[x] -> Log[3 e^x + \frac{x^3}{3} + C[1]]} }`

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

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

`{ {y[x] → x + x^2 + x^3 + C[1] } }`

**Ques 4. Solve First order Differential Equation $y'[x] + y = \text{Exp}[-x]$,
 $y(0) = 1$?**

`DSolve[{y' [x] + y[x] == Exp[-x], y[0] == 1}, y[x], x]`

`{ {y[x] → e-x (1 + x) } }`

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:**

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

`{ {y[x] → -ex + $\frac{x^2}{2}$ - $\frac{1}{2}x(2+x)$ + ex + $\frac{x^2}{2}$ C[1] } }`

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

`-10 ex + $\frac{x^2}{2}$ - $\frac{1}{2}x(2+x)$ - ex + $\frac{x^2}{2}$ - $\frac{1}{2}x(2+x)$`

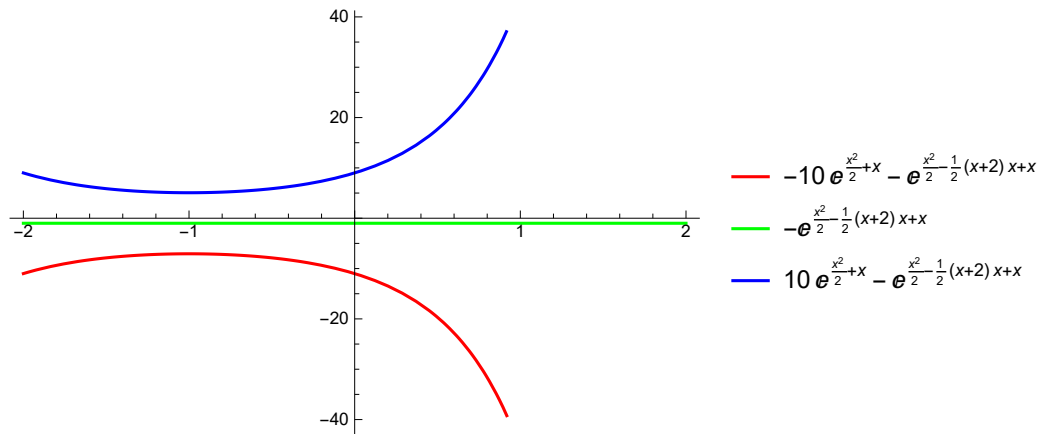
`Sol2 = y[x] /. Sol[[1]] /. {C[1] → 0}`

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

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

`10 ex + $\frac{x^2}{2}$ - $\frac{1}{2}x(2+x)$ - ex + $\frac{x^2}{2}$ - $\frac{1}{2}x(2+x)$`

```
Plot[{Sol1, Sol2, Sol3}, {x, -2, 2},
PlotStyle -> {{Red}, {Green}, {Blue}}, PlotLegends -> {Sol1, Sol2, Sol3}]
```



Ques 2. Solve the First Order Differential Equation $y'[x] - \text{Exp}[x - y] - x^2 * \text{Exp}[-y] = 0$ and plot its three Solutions?

SOL :

```
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.

```
{ {y[x] -> Log[e^x + x^3/3 + C[1]] } }
```

```
Sol1 = y[x] /. Sol[[1]] /. {C[1] -> 10}
```

```
Log[10 + e^x + x^3/3]
```

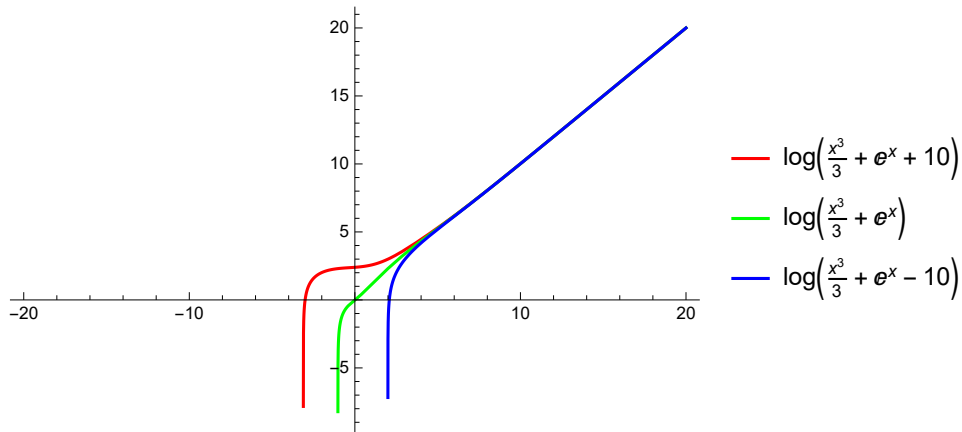
```
Sol2 = y[x] /. Sol[[1]] /. {C[1] -> 0}
```

```
Log[e^x + x^3/3]
```

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

```
Log[-10 + e^x + x^3/3]
```

```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
PlotStyle -> {{Red}, {Green}, {Blue}}, PlotLegends -> {Sol1, Sol2, Sol3}]
```



Ques 3. Solve the First Order Differential Equation $y'[x] * \text{Sin}[\text{Pi} * x] - y[x] * \text{Cos}[\text{Pi} * x] = 0$ and plot its three Solutions?

SOL :

```
ClearAll
```

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

```
ClearAll
```

```
{ {y [x] -> C [1] Sin [pi x]^(1/pi) } }
```

```
Sol1 = y [x] /. Sol[[1]] /. {C [1] -> 10}
```

```
10 Sin [pi x]^(1/pi)
```

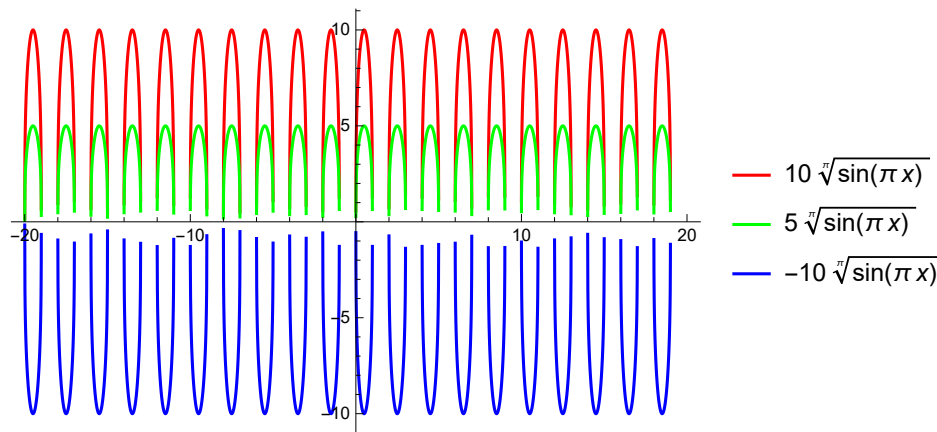
```
Sol2 = y [x] /. Sol[[1]] /. {C [1] -> 5}
```

```
5 Sin [pi x]^(1/pi)
```

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

```
-10 Sin [pi x]^(1/pi)
```

```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},
  PlotStyle -> {{Red}, {Green}, {Blue}}, PlotLegends -> {Sol1, Sol2, Sol3}]
```



Ques 4. Solve the First Order Differential Equation $y'[x] * (x - 1) - 2x * y[x] = 0$ and plot its three Solutions?

SOL :

```
ClearAll
```

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

```
ClearAll
```

```
{ {y[x] -> e^{2 (x+Log[-1+x])} C[1]} }
```

```
Sol1 = y[x] /. Sol[[1]] /. {C[1] -> 10}
```

```
10 e^{2 (x+Log[-1+x])}
```

```
Sol2 = y[x] /. Sol[[1]] /. {C[1] -> 1}
```

```
e^{2 (x+Log[-1+x])}
```

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

```
-10 e^{2 (x+Log[-1+x])}
```

```
Plot[{Sol1, Sol2, Sol3}, {x, -20, 20},  
PlotStyle -> {{Red}, {Green}, {Blue}}, PlotLegends -> {Sol1, Sol2, Sol3}]
```

