

Practical 7 :

Solve the system of ordinary differential equations of the type

$$\frac{dx}{dt} = ax + by, \quad x(0) = x_0$$

$$\frac{dy}{dt} = ax + by, \quad y(0) = y_0$$

```
In[ ]:= sol = DSolve[{D[x[t], t] == a * x[t] + b * y[t],
  D[y[t], t] == a * x[t] + b * y[t], x[0] == p, y[0] == q}, {x[t], y[t]}, t]
```

```
Out[ ]:= {{x[t] -> (b p + a e^{(a+b) t} p - b q + b e^{(a+b) t} q) / (a + b), y[t] -> (-a p + a e^{(a+b) t} p + a q + b e^{(a+b) t} q) / (a + b)}}
```

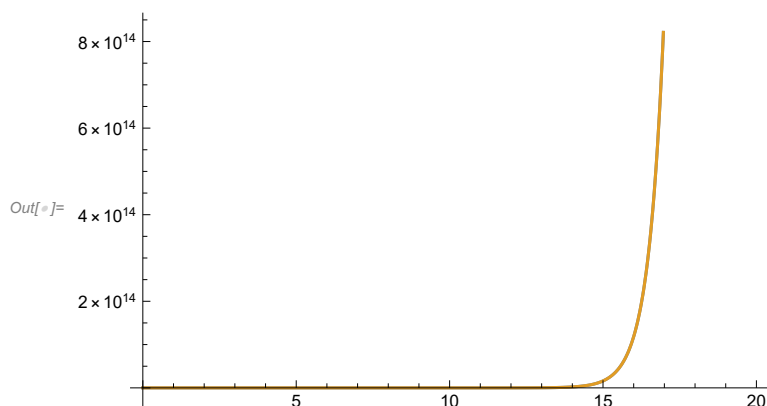
```
In[ ]:= x[t_] = x[t] /. sol /. {a -> 1, b -> 1, p -> 1, q -> 2}
```

```
Out[ ]:= {1/2 (-1 + 3 e^{2 t})}
```

```
In[ ]:= y[t_] = y[t] /. sol /. {a -> 1, b -> 1, p -> 1, q -> 2}
```

```
Out[ ]:= {1/2 (1 + 3 e^{2 t})}
```

```
In[ ]:= Plot[{x[t], y[t]}, {t, 0, 20}]
```

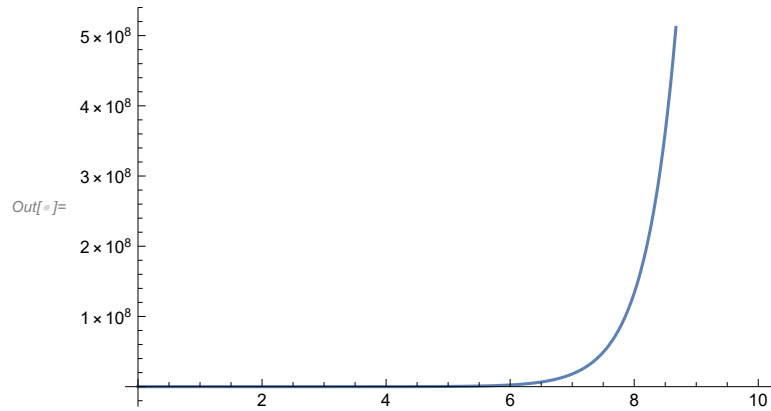


```
In[ ]:= x[t_] = x[t] /. sol /. {a -> 1, b -> 1, p -> 10, q -> 20}
      y[t_] = y[t] /. sol /. {a -> 1, b -> 1, p -> 10, q -> 20}
```

```
Out[ ]:=  $\left\{ \frac{1}{2} \left( -10 + 30 e^{2t} \right) \right\}$ 
```

```
Out[ ]:=  $\left\{ \frac{1}{2} \left( 10 + 30 e^{2t} \right) \right\}$ 
```

```
In[ ]:= Plot[%, {t, 0, 10}]
```



(* For various values of constants we
can find the solution of system of ODE given. *)