1.

a.

In[4]:=
```
DSolve[c'[t] == F/V cin - F/V c[t], c[t], t]
```
Out[4]= $\{\{c[t] \to cin + e^{-\frac{F t}{V}} C[1]\}\}$

b.

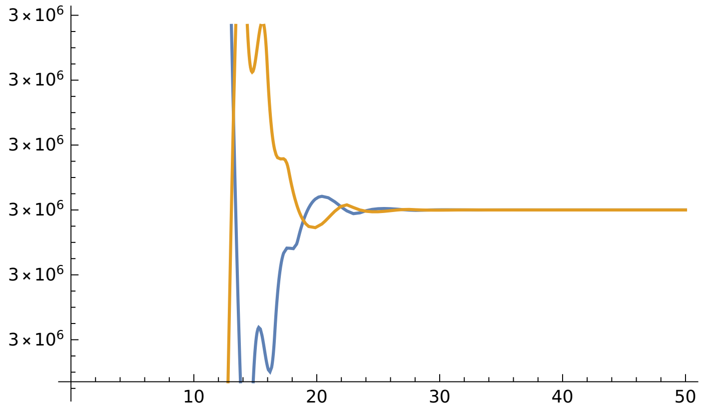
```
Module[{F, V, cin},
 F = 48 × 10^6;
 V = 28 × 10^6;
 cin = 3 × 10^6;
 sol1[t_] = c[t] /. NDSolve[{c'[t] == F/V cin - F/V c[t], c[0] == 6 × 10^6}, c[t], {t, 0, 50}];]
```

c.

```
Module[{F, V, cin},
 F = 48 × 10^6;
 V = 28 × 10^6;
 cin = 3 × 10^6;
 sol2[t_] = c[t] /. NDSolve[{c'[t] == F/V cin - F/V c[t], c[0] == 1 × 10^6}, c[t], {t, 0, 50}];]
```

d.

In[3]:=
```
Plot[{sol1[t], sol2[t]}, {t, 0, 50}]
```
Out[3]=



2.

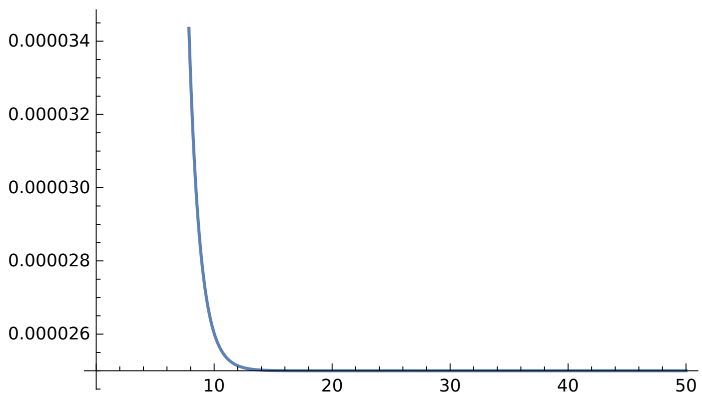
a.

DSolve cannot find an analytical solution but NDSolve can approximate a solution given all conditions and can be seen below.

b.

In[6]:=
```
Module[{s, α, n, sol},
 s = 0.01;
 α = 1/2;
 n = 2;
 sol[t_] = r[t] /. NDSolve[{r'[t] == s (r[t])^α - n r[t], r[0] == 5}, r[t], {t, 0, 50}];
 Plot[sol[t], {t, 0, 50}]]
```

Out[6]=

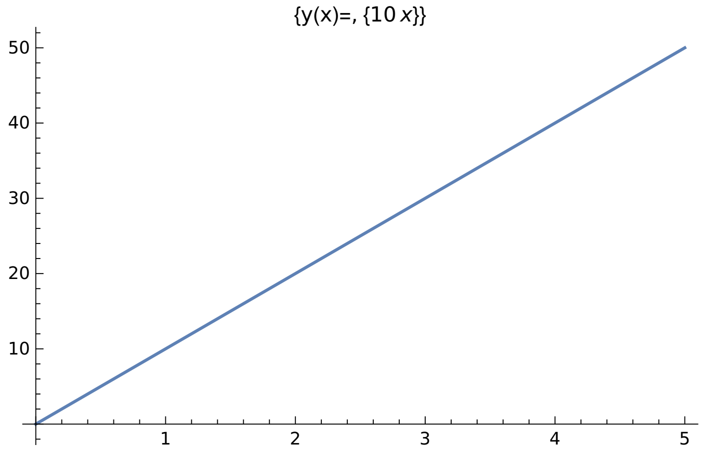


3.

a.

In[24]:=
```
Module[{sol},
 sol[x_] = y[x] /. DSolve[{x y'[x] == y[x], y[1] == 10}, y[x], x];
 Plot[sol[x], {x, 0, 5}, PlotLabel → {"y(x)=", sol[x]}]]
```

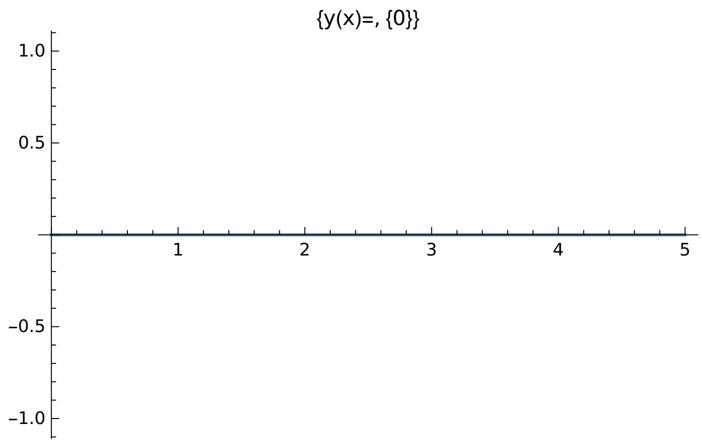
Out[24]=



b.

In[23]:=
```
Module[{sol},
 sol[x_] = y[x] /. DSolve[{x y'[x] == y[x], y[1] == 0}, y[x], x];
 Plot[sol[x], {x, 0, 5}, PlotLabel → {"y(x)=", sol[x]}]]
```

Out[23]=



c.

In[26]:=
```
Module[{sol},
 sol[x_] = y[x] /. DSolve[{x y'[x] == y[x], y[0] == 1}, y[x], x];
 Plot[sol[x], {x, -1, 5}, PlotLabel → {"y(x)=", sol[x]}]]
```

DSolve: For some branches of the general solution, the given boundary conditions lead to an empty solution.

Out[26]=