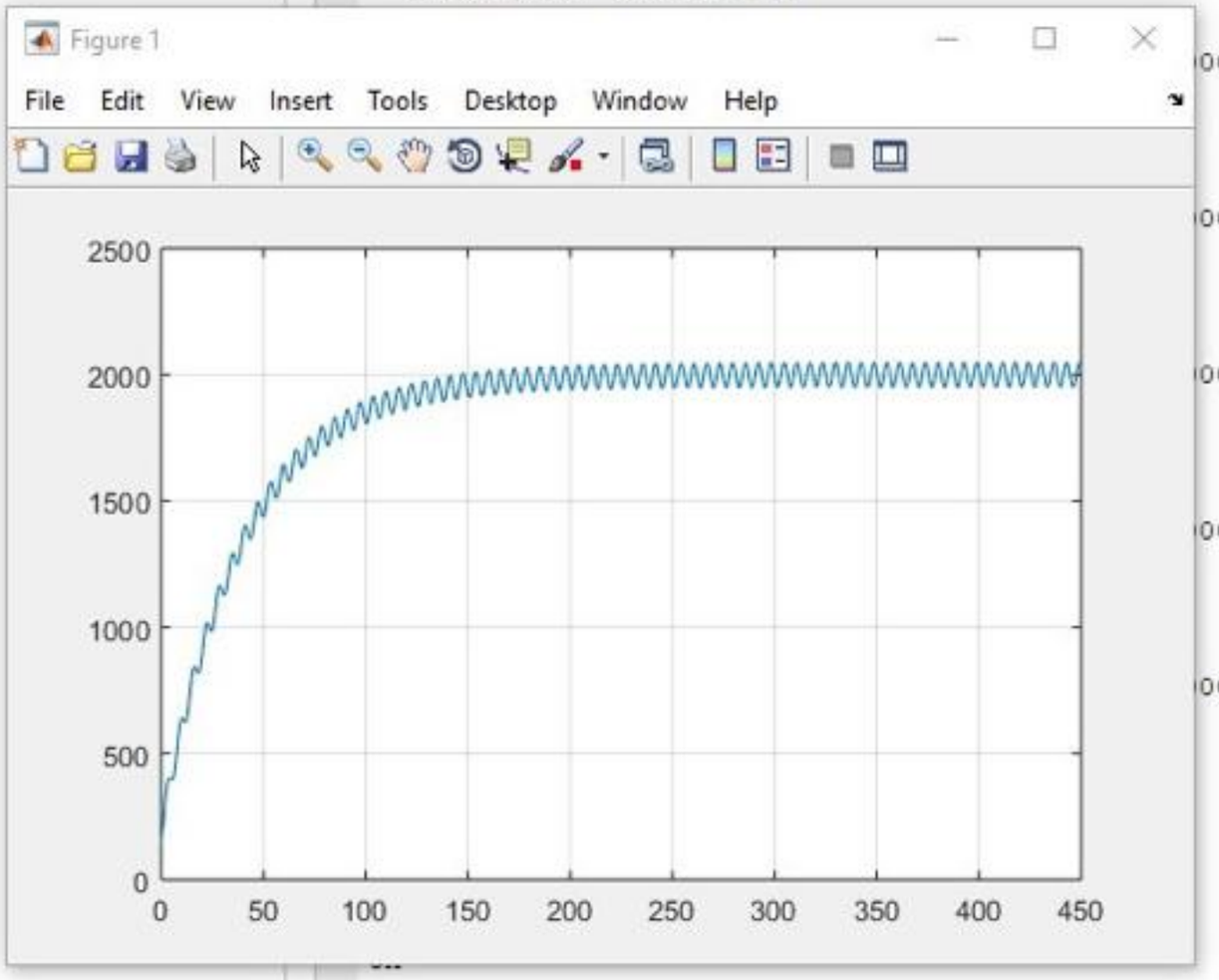
```
commandwindow
clear
clc
close all
syms m t
ans=dsolve('Dm+0.025*m=50+50*sin(t)','m(0)=150')
t=0:0.5:450
tn=subs(ans,t)
plot(t,tn)
grid on
```




```
[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1
>>
```

```
1 -  commandwindow
2 -  clear all
3 -  clc
4 -  syms y(t)
5 -  Q=diff(y)==50*(1+sin(t))-(0.025*y)
6 -  Cond=y(0)==150
7 -  Ysol(t)=dsolve(Q,Cond)
8 -  t=0:0.5:450
9 -  plot (t,Ysol(t))
10 -  grid on
11 -  grid minor
```

Command Window

New to MATLAB? See resources for Getting Started.

```
   444.0000   444.5000   445.0000   445.5000   446.0000   446.5000   447.0000   447.5000   448.0000   448.5000   449.0000   449.5000

  Column 901

   450.0000

fx >>
```

script Ln 11 Col 11

9:38 AM
06/05/2020

```
commandwindow
clear
clc
close all
t=1:2:500;
y=((50/0.05) + ((50/1.0025)*sin(t)) + (((50*0.05)/1.0025)*cos(t)) - (802.49*exp(-0.05*t)))
tm=0:2:500;
ym=((1000)-(800*exp(-0.05*tm)))
T=[t,tm]
Y=[y,ym]
plot(T,Y,'green')
grid on
grid minor
xlabel('T(min)')
ylabel('V(litre)')
col_header={'t(min)','V(Litre'};
xlswrite('odevbesdata.xlsx',[T(:),Y(:)],'veriler','A2');
xlswrite('odevbesdata.xlsx',col_header,'veriler','A1');
```

Command Window

```
Columns 481 through 492

  1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

Columns 493 through 501

  1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000

fx >>
```

TAIWO ① AMILLOLA
18/ENG 05/058
MECHATRONICS

1 $dy/dt = y_{in} - y_{out}$

$y_{in} = \frac{50 gal}{min} \times (1+\sin t)\frac{16}{gal} = 50(1+\sin t)\ ^{16}/_{min}$.

$\frac{30}{1200} = 0.025$

$y_{out} = 2.5\%$ of y

$dy/dt = 50(1+\sin t) - 0.025y$

b) $dy/dt + 0.025y = 50(1+\sin t)$

$dy/dt + Py = Q$

$P = 0.025$, $Q = 50(1+\sin t)$

$I.F = e^{\int P dt}$, $\int P dt = 0.025t$,

$\therefore IF = e^{0.025t}$

$y \cdot IF = \int Q \cdot IF$

$y \cdot e^{0.025t} = \int 50(1+\sin t) \cdot e^{0.025t} dt$

$y \cdot e^{0.025t} = 50 \int e^{0.025t} + e^{0.025t} \cdot \sin t \cdot dt$

$y \cdot e^{0.025t} = 50\left(\frac{e^{0.025t}}{0.025}\right) + \int e^{0.025t} \cdot \sin t \cdot dt$

Using integral by Parts to solve the above RHS equation.

$\int uv\,dx = u\int v\,dx - \int u'\left(\int v\,dx\right)dx$

$u = e^{0.025t}$ $\therefore du/dt = 0.025e^{0.025t}$

$v = \sin t$ $\therefore \int v\,dt = \int \sin t\,dt$

$= -\cos t$

$\int e^{0.025t} \cdot \sin t \cdot dt = -e^{0.025t}\cos t + 0.025\int e^{0.025t} \cos t + C$

$= -e^{0.025t} \cdot \cos t + 0.025\left(e^{0.025t}\sin t - 0.025\int e^{0.025t}\sin t\right)$

let $A = \int e^{0.025t}\sin t$

$A = -e^{0.025t}\cos t + 0.025\left(e^{0.025t}\sin t - 0.025A\right)$

$$A = -e^{0.025t}\cos t + 0.025e^{0.025t}\sin t - 0.000625A$$

$$1A + 0.000625A = -e^{0.025t}(\cos t - 0.025\sin t)$$

$$1.000625A = -e^{0.025t}(\cos t - 0.025\sin t)$$

$$A = \frac{-e^{0.025t}}{1.000625}(\cos t - 0.025\sin t) + c$$

$$ye^{0.025t} = 50\left(\frac{e^{0.025t}}{0.025} - \frac{e^{0.025t}}{1.000625}(\cos t - 0.025\sin t) + c\right)$$

$$ye^{0.025t} = 2000e^{0.025t} - 49.97e^{0.025t}(\cos t - 0.025\sin t) + 50y_0$$

$$y = 2000 - 49.97(\cos t - 0.025\sin t) + \frac{50y_0}{e^{0.025t}}$$

$t = 0$ and $y = 150$ lb

$$150 = 2000 - 49.97(\cos(0) - 0.025\sin(0)) + \frac{50y_0}{e^{0.025(0)}}$$

$$150 = 2000 - 49.97(1-0) + 50y_0$$

$$y_0 = -36$$

$$y = 2000 - 49.97(\cos t - 0.025\sin t) - \frac{50y_0 \times (-36)}{e^{0.025t}}$$

~~$y = 2000 - 49.97(\cos(0) - 0.025\sin(0)) - \frac{50(-36)}{e^{0.025(0)}}$~~

From question, amount of salt at time $t = m$ and $y_0 = (-36)$

Therefore, $m = 2000 - 49.97(\cos t - 0.025\sin t)\frac{1800}{e^{0.025t}}$