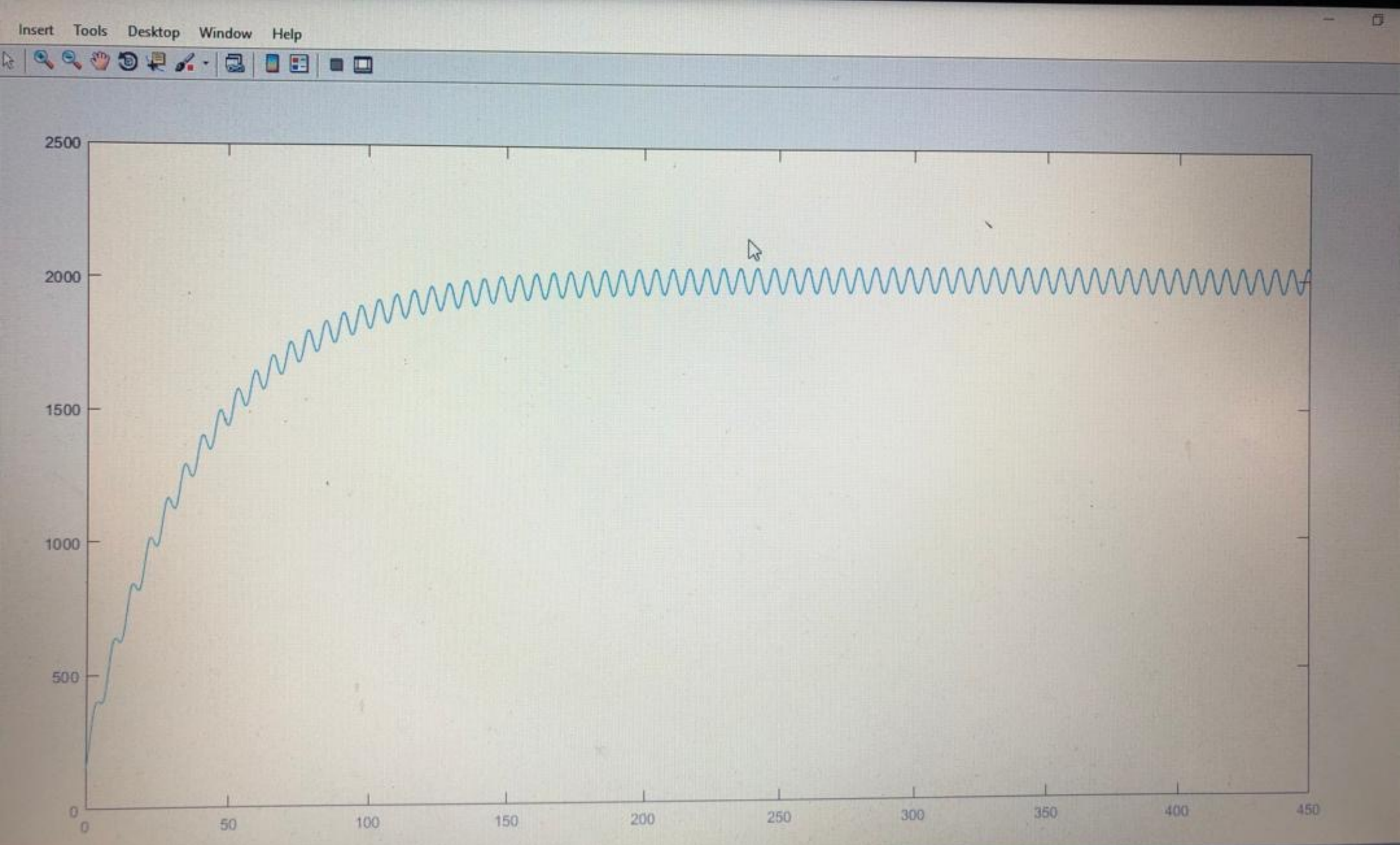
Insert Tools Desktop Window Help



```
1 -  commandwindow
2 -  clear
3 -  clc
4 -  close all
5 -  syms m t
6 -  ans=dsolve('Dm+0.025*m=50+50*sin(t)','m(0)=150')
7 -  t=0:0.5:450
8 -  tn=subs(ans,t)
9 -  plot(t,tn)
```

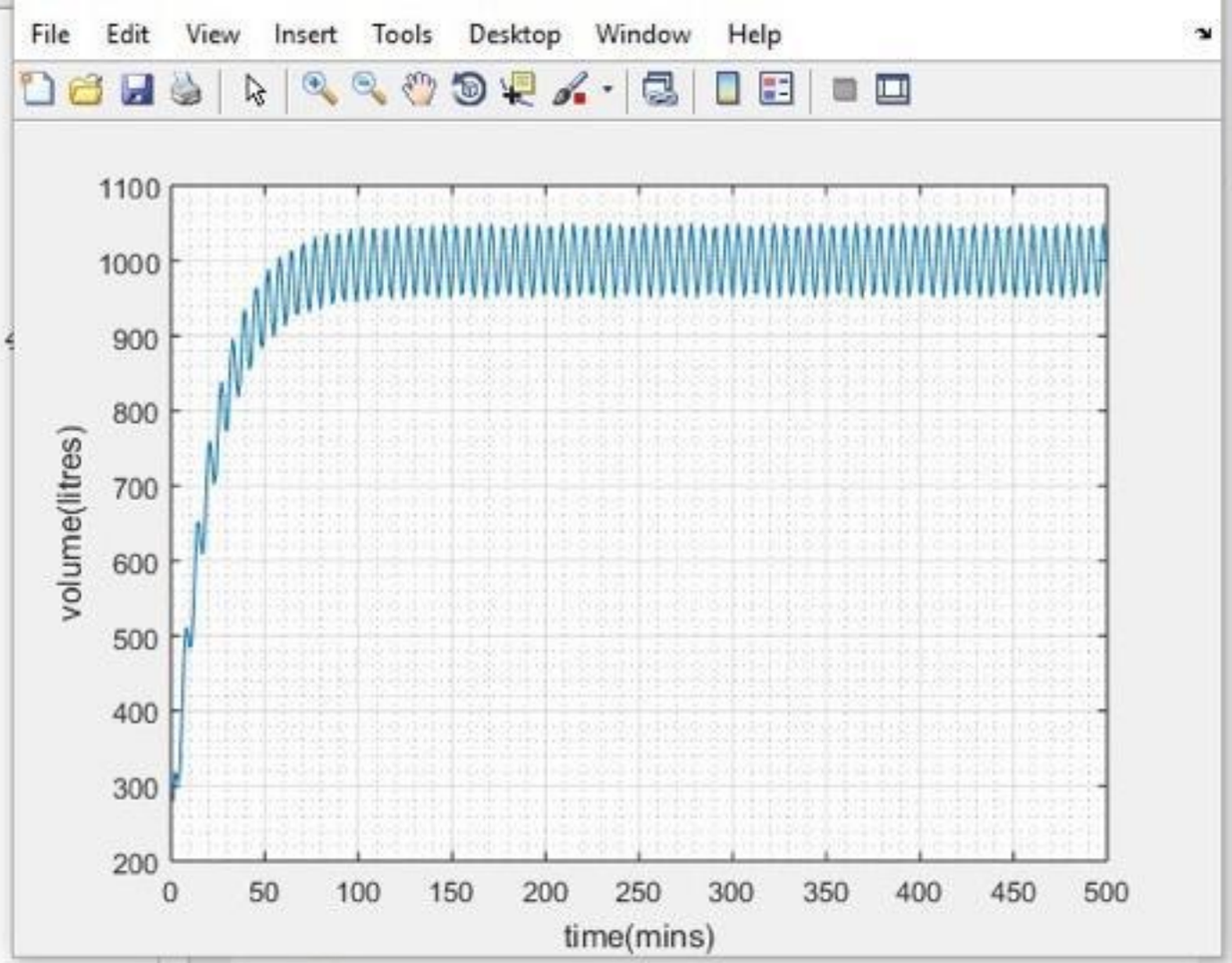
Command Window

New to MATLAB? See resources for Getting Started.

```
   445.5000   446.0000   446.5000   447.0000   447.5000   448.0000   448.5000   449.0000   449.5000   450.0

tn =

[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (2881850*exp(-1/80))/1601, 2000 - (20
fx >>
```

script

```
commandwindow
clear
clc
close all
syms t
values=[]
t=1:1:500
mean=1000-((exp(-0.05*t))*800)
y=1000+(50/1.0025)*sin(t)+(2.5/1.0025)*cos(t)-((exp(-0.05*t))*802.4

if rem(t,2) ==0
    values=[values,mean]
else
    values=[values,y]
end
excelvalues=transpose(values)
mins=transpose(t)
plot(t,values)
grid on
grid minor
xlabel ('time(mins)')
ylabel('volume(litres)')
xlswrite('odevbesdata.xlsx',{'t(min)'},'veriler','A1')
xlswrite('odevbesdata.xlsx',mins,'veriler','A2')
xlswrite('odevbesdata.xlsx',{'V(Litre)'},'veriler','B1')
xlswrite('odevbesdata.xlsx',excelvalues,'veriler','B2')

```




```
498
499
500
```

fx >>

Engineering Maths II

Assignment

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18/ENG01/021

Question 1

Denoting the amount of salt present in the tank at any time t as y, its time rate of change is given as:

$$\frac{dy}{dt} = y_{in} - y_{out} \quad \cdots (*)$$

Since 50 gallons enter per minute and one gallon contains $(1+\sin t)$ lb of salt, it means that the amount of salt entering the tank is:

$$y_{in} = 50 \text{ gal/min} \times 1+\sin t \text{ lb/gal} = 50(1+\sin t) \text{ lb/min}$$

The tank contains 1200 gal of water with the dissolved salt, and 30 gal of the mixture leave the tank per minute. that is, $\frac{30 \text{ gal}}{1200 \text{ gal}} = 0.025 = 2.5\%$ of the content of the tank. If that is the case, 2.5% of the salt present in the tank will also leave the tank per minute. In other words, $y_{out} = 2.5\%$ of y

$\therefore$ from equ (*)

$$\frac{dy}{dt} = 50(1+\sin t) - 2.5\% \text{ of } y$$

$$\frac{dy}{dt} = 50(1+\sin t) - 0.025y$$

$$\frac{dy}{dt} + 0.025y = 50(1+\sin t)$$

~~Multiply both sides by dt~~

Using the Linear equation ~~method~~ is used;

$$\frac{dy}{dx} + Py = Q$$

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

By Applying the integration factor,

$$y \cdot I_f = \int Q \cdot I_f \, dt$$

$$\int P \cdot dt = 0.025t \quad \therefore I_f = e^{0.025t}$$

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

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

$$ye^{0.025t} = 2000e^{0.025t} - 50 \cdot \frac{e^{0.025t}}{1.000625}(cost - 0.025) + 50c$$

[divide through by $e^{0.025t}$ y]

$$\therefore y = 2000 - \frac{50}{1.000625}(cost - 0.025) + \frac{50c}{e^{0.025t}}$$

Given that when $t = 0$ min (initially),

$y = 150$ lb,

$$\therefore 150 = 2000 - \frac{50}{1.000625}(1 - 0) + \frac{50c}{1}$$

$$150 = 2000 - 49.968(1) + 50c$$

$$150 = 1950.032 + 50c$$

$$-1800.032 = 50c$$

$$c = -1800.032 / 50 = -36.00064$$

$$ye^{0.025t} = 50\int e^{0.025t} + e^{0.025t}\sin t\,dt$$

$$ye^{0.025t} = 50\int e^{0.025t} + \int e^{0.025t}\sin t\,dt$$

$$ye^{0.025t} = 50\,\frac{e^{0.025t}}{0.025} + \int e^{0.025t}\sin t\,dt$$

[By Applying integration by parts]

$$\int uv = uv - \int v\,du$$

$$u = e^{0.025t}, \quad dv = \sin t$$

$$du = 0.025e^{0.025t} \qquad v = -\cos t$$

$$\therefore \int e^{0.025t}\sin t = e^{0.025t}\cdot -\cos t - \int -\cos t \cdot 0.025e^{0.025t}$$

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

$$\therefore \int e^{0.025t}\sin t = -e^{0.025t}\cos t + 0.025\int e^{0.025}\cos t$$

(we apply integration by parts again)

$$u = e^{0.025t} \qquad dv = \cos t$$

$$du = 0.025\,e^{0.025t} \qquad v = \sin t$$

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

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

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

$$\therefore P = -e^{0.025t}\cos t + 0.025\left[e^{0.025t}\sin t - 0.025P\right]$$

$$P = -e^{0.025t}\cos t + 0.025e^{0.025t} - [6.25\times10^{-4}P]$$

$$P + (6.25\times10^{-4})P = -e^{0.025t}\cos t + 0.025\,e^{0.025t}$$

$$1.000625P = -e^{0.025t}\cos t + 0.025\,e^{0.025t}$$

$$1.000625\,P = -e^{0.025t}(\cos t - 0.025)$$

$$P = -\frac{e^{0.025t}}{1.000625}(\cos t - 0.025) + C$$

$$P = -\frac{e^{0.025t}}{1.000625}$$

$$\therefore \int e^{0.025t}\sin t = -\frac{e^{0.025t}}{1.000625}(\cos t - 0.025) + C$$

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