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MATRIC NUMBER: 18/ENG05/022.

DEPARTMENT: BIOMEDICAL ENGINEERING.

COURSE: ENGINEERING MATHEMATICS (ENG 282)

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1) $\frac{dy}{dt} = y_{in} - y_{out}$

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

∴ Since each gallon contains $(1 + \sin t)$ lb of dissolved salt per minute, therefore $t = 1$

$\therefore 1 - \sin(1) = 1 + 0.01745 = 1.01745$ lb.

$\therefore y_{in} = 50\ \frac{gal}{min} \times 1.01745\ \frac{lb}{gal} = 50.87\ \frac{lb}{min}$

$\frac{30\ gal}{1200\ gal} = 0.025 = 2.5\%$.

∴ 2.5% of the salt present will leave the tank per minute -

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

~~$\frac{dy}{dt}\ \frac{lb}{min} = 50\ \frac{lb}{min} - 2.5$~~

$\frac{dy}{dt}\ \frac{lb}{min} = 50.87\ \frac{lb}{min} - 2.5\%\ y\ \frac{lb}{min}$

$\frac{dy}{dt} = 50.87 - 0.025y$

$\frac{dy}{dt} = -0.025y + 50.87$

$\frac{dy}{dt} = -0.025\left(\frac{-0.025y}{-0.025} + \frac{50.87}{-0.025}\right)$

$\frac{dy}{dt} = -0.025(y - 2034.8)$.

$$\frac{dy}{(y-203.8)} = -0.025\,dt$$

$$\int \frac{dy}{(y-203.8)} = \int -0.025\,dt$$

$$\ln(y-203.8) = -0.025t + C$$

$$y - 203.8 = e^{-0.025t + C}$$

$$y - 203.8 = e^{-0.025t} e^{C}$$

$$y - 203.8 = e^{-0.025t} y_0 \quad (e^{C} = y_0)$$

$$y - 203.8 = y_0 e^{-0.025t}$$

$$y = y_0 e^{-0.025t} + 203.8$$

Given that when $t = 0$ min (initially), $y = 150$ lb

$$150 = y_0 e^{-0.025(0)} + 203.8$$

$$150 = y_0 \times 1 + 203.8$$

~~$y_0 = 2$~~

$$150 - 203.8 = y_0 \times 1$$

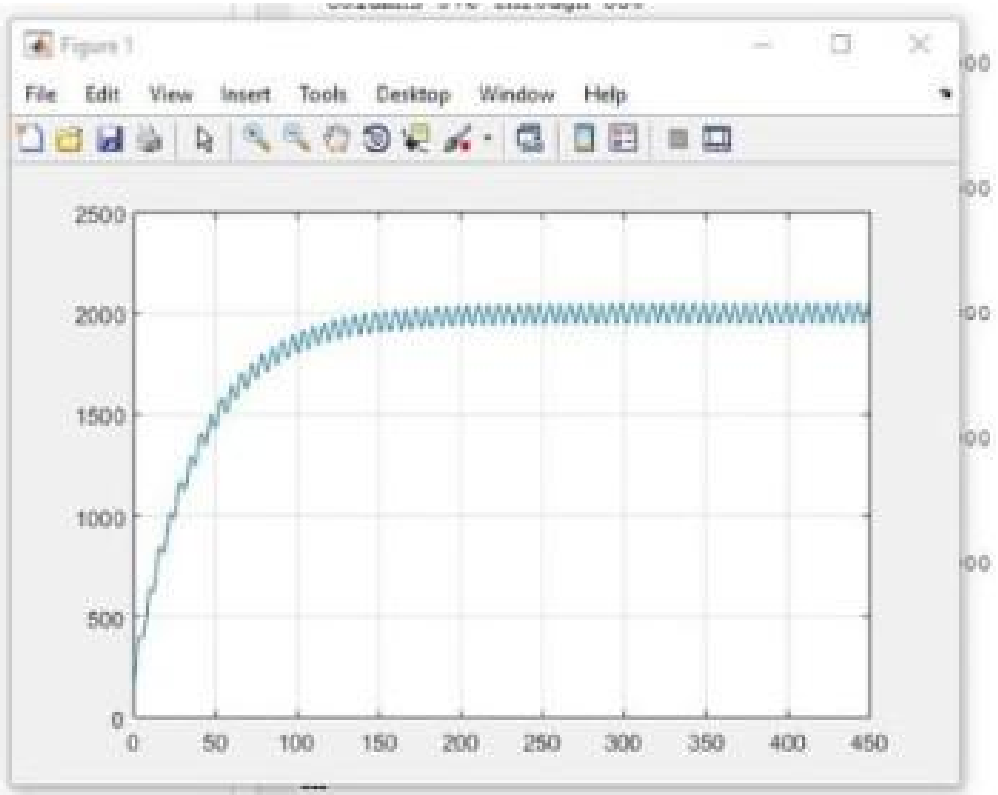
$$-188.8 = y_0$$

$$\therefore \quad y = -188.8 e^{-0.025t} + 203.8$$

$$y = 203.8 - 188.8 e^{-0.025t}$$

Please sir my matlab work might look like I copied. But the truth is that I asked my friends to do it for me because matlab is still not working on my computer and my windows license has expired. Sir I am unable to fix this due to the lockdown. I really hope you understand my situation.

```
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
```

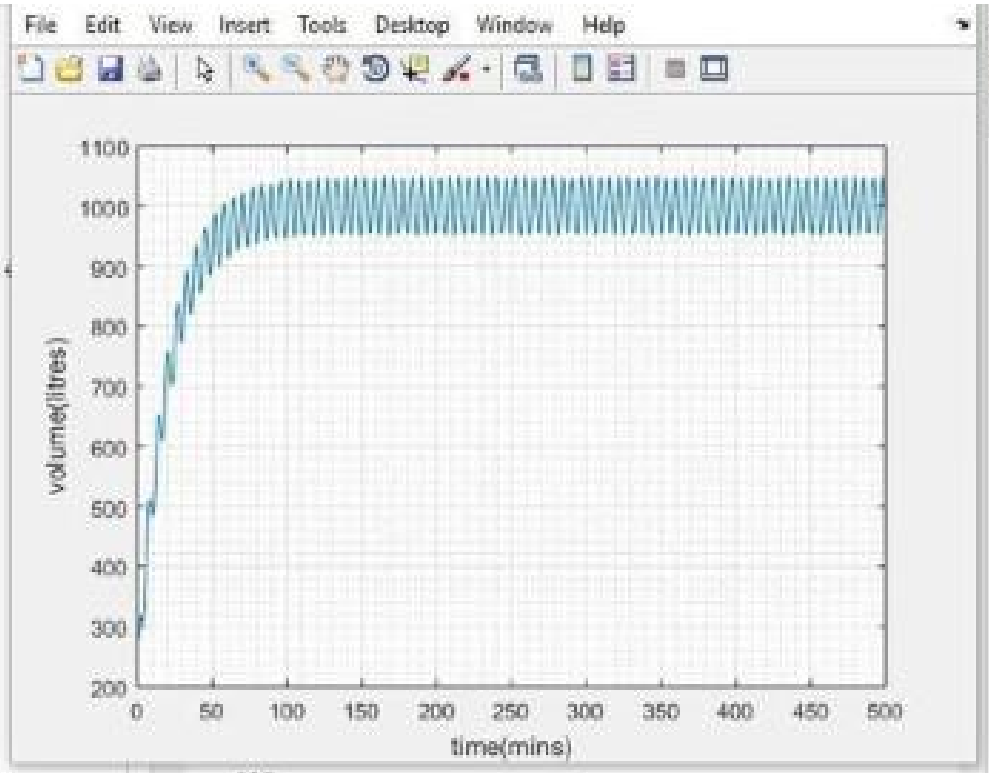



```
[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1
>>
```

```
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 >>
```