```
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.

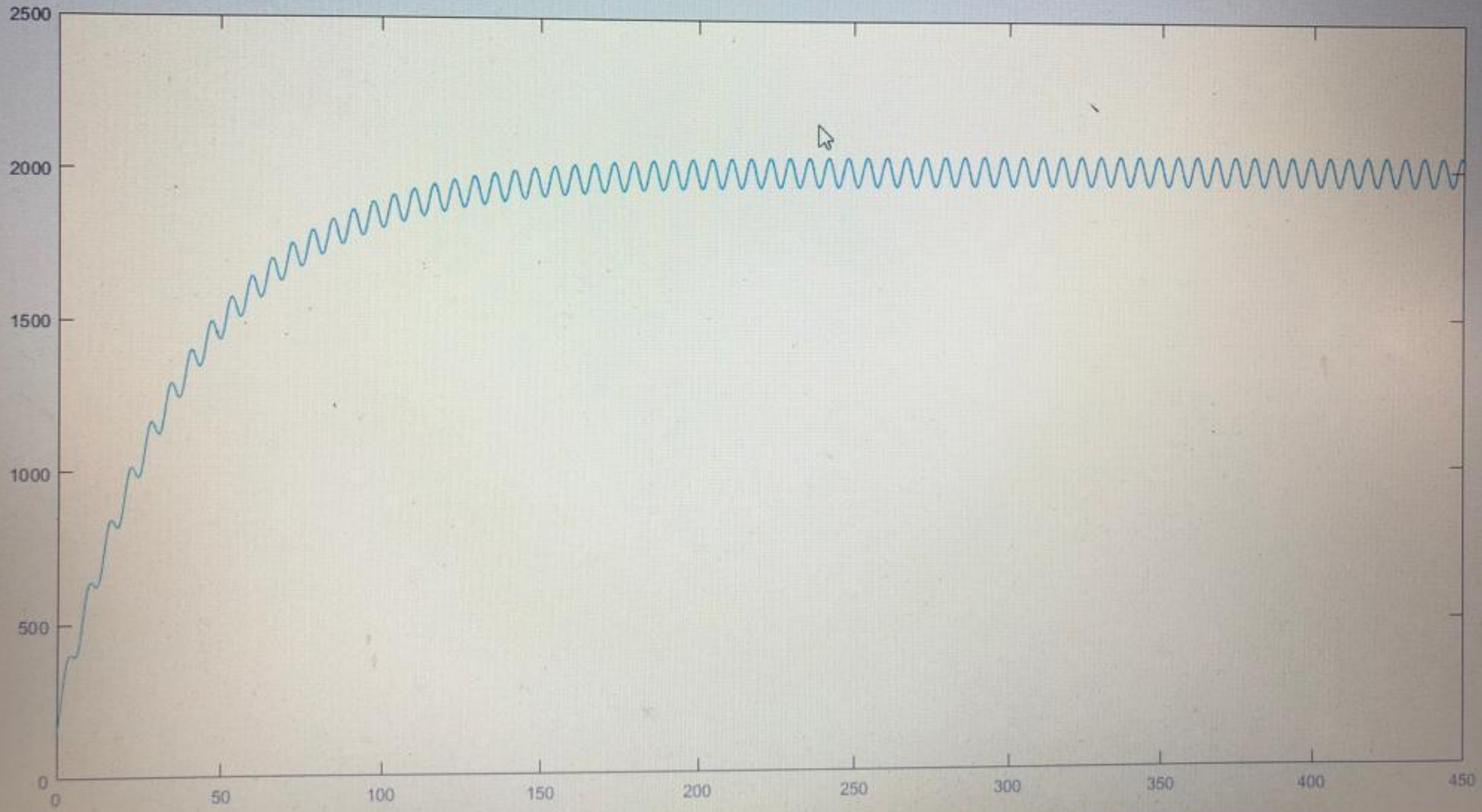
```
   445.5000   446.0000   446.5000   447.0000   447.5000   448.0000   448.5000   449.0000   449.5000   450.0

tn =

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

script

Insert Tools Desktop Window Help



5. $\int e^{0.025t} \sin t = e^{0.025t} - \cos t - \int -\cos t - 0.$

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

Using Integration by part,

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

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

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

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

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

Let $Q = \int e^{0.025t} \sin t$

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

$Q = -e^{0.025t} \cos t + 0.025\, e^{0.025t} - 6.25^{-4} Q$

$Q + 6.25^{-4} Q = -e^{0.025t} \cos t + 0.025 e^{0.025t}$

$Q + 0.000250 = -e^{0.025t} \cos t + 0.025 e^{0.025t}$

$1.000625Q = -e^{0.025t} \cos t + 0.25 e^{0.025t}$

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

4 $\frac{dy}{dt} = 50(1+\sin t) - 0.025y$

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

Using the linear equation method

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

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

$\int P \cdot dt = 0.025t$

$I.f = e^{\int P \cdot dt}$

$I.f = e^{0.025t}$

$y \times IF = \int Q \, I.F \, dt$

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

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

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

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

Using integration by part, $\int U \cdot dV = UV - \int V dU$

$\int e^{0.025t} \sin t \cdot dt$

$U = e^{0.025t} \quad dV = \sin t$

$dU = 0.025e^{0.025t} \quad V = -\cos t$

2 from $\frac{dm}{dt} = m_{in} - m_{out}$

$\frac{dm}{dt} = 50(1+\sin t) - 2.5\%$ of m

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

3 $\frac{dy}{dt}_{in} = y_{in} - y_{out}$

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

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

∴ by Separating the Variables

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

mutiply both sides by dt

$1 + 0.25y\,dy = 50(1+\sin t)\,dt$

AIKU JOSHUA ADEBIYI
ELECTRICAL/ELECTRONICS

18/ENG04/007
ENGINEERING MATH

1 Mixing
1 20 gal of water
1 50lb of salt — Initially

50gal of brine (Salt and water), each contain (1+sint)
lb of salt

3Ogal/min removes from the tank.
Accumulation rate within a system:
Input rate into the - Output rate from the system

$$\frac{dy}{dt} = y_{in} - y_{out} : \frac{dm}{dt} = m_{in} - m_{out}$$

Since 30gal removes per minute, and one gallon contains (1+sint) lb of salt, it means that the amount of salt leaving the tank is $m_{in} = 50\frac{gal}{min} \times (1+sint)\frac{lb}{gal}$

$m_{in} = 50(1+sint)\,lb/min$

The tank contains 120ogal of water with dissolved salt, and 3ogal of the solution leaves the tank per minute,

$\frac{3Ogal}{1200gal} = 0.025 = 2.5\%$ of the content of the tank If that is the the case 2.5% of salt present in the tank will also leave the tank at 2.5% rate