

Nwala Ugochukwu Chemezindu

18/EUG06/045

- 1) 1200 gal. of water, 150 lb of dissolved salt
50 gal of brine, each gallon contains $(1 + \sin t)$ lb of dissolved salt
Rate = 30 gal. per minute

$$\therefore \frac{dy}{dt} = y_{in} - y_{out} \dots (2)$$

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

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

$$y_{out} = \frac{30}{1200} = 0.025 = 2.5\% \text{ of } y \text{ or } m$$

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

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

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

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

$$\frac{dy}{dt} = -0.025 (y - 2000(1 + \sin t))$$

$$\frac{dy}{y - 2000(1 + \sin t)} = -0.025 dt$$

$$y - 2000(1 + \sin t)$$

$$\int \frac{dy}{y - 2000(1 + \sin t)} = \int -0.025 dt$$

$$\int \ln(y - 2000(1 + \sin t)) = -0.025 t + C$$

$$y - 2000(1 + \sin t) = e^{-0.025 t + C}$$

$$y - 2000(1 + \sin t) = e^{-0.025 t} e^C$$

$$y - 2000(1 + \sin t) = e^{-0.025 t} y_0 \text{ or } M_0$$

$$y - 2000(1 - \sin t) = y_0 e^{-0.025t}$$

when $t = 0$ ms initially $y = 150$ lb

$$150 - 2000(1 - \sin(0)) = y_0 e^{-0.025(0)}$$

$$150 - 2000 = y_0$$

$$\therefore y_0 = -1850$$

$$\therefore y = 2000(1 - \sin t) - 1850e^{-0.025t}$$

B) Using math lab

1) Command window

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)

EDITOR PUBLISH VIEW

Insert \int $\frac{1}{x}$ $\frac{1}{x^2}$

To Comment $\%$ $\%$ $\%$

Indent \leftarrow \rightarrow \leftarrow \rightarrow

BREAKPOINTS EDIT RUN

Breakpoints Run Run and Advance Run Section Advance Run and Time

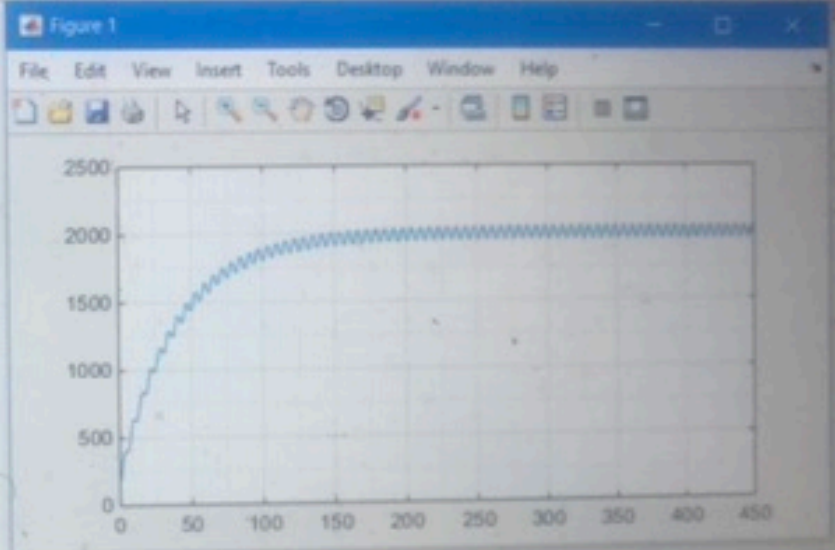
Documents > matlab > MATLAB FILE > bin >

Editor - C:\Users\Neddy\Documents\matlab\MATLAB FILE\bin\Untitled21111.m

```

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)
10 - grid on
11 - grid minor
12 - 18/Eng06/045 mechanical engineering

```



Command Window

Columns 885 through 897

442.0000 442.5000 443.0000 443.5000 444.0000 444.5000 445.0000 445.5000 446.0000 446.5000 447.0000 447.5000 448.0000

Columns 898 through 901

448.5000 449.0000 449.5000 450.0000

tn =

[150, (2000*sin(1/2))/1601 - (2881850*exp(-1/80))/1601 - (80000*cos(1/2))/1601 + 2000, (2000*sin(1))/1601 - (2881850*exp(-1/40))/1601 -

>>

script ln 12 Col 36