

Eng 282
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11/Eng 02/012
Computer Engineering

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

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

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

multiply both side by dt
 $1 + 0.025y dy = 50(1 + \sin t) dt$

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

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

Using the linear equation method

$$\frac{dy}{dt} + py = Q$$

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

$\therefore \int p \cdot dt = 0.025t$

$I \cdot f = e^{0.025t}$

$I \cdot f = e^{0.025t}$

$y = I \cdot f = \int Q I f dt$

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

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

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

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

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

Using integration by part

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

$$du = 0.025 e^{0.025t} \quad dv = \sin t \quad u = e^{0.025t} \quad v = -\cos t$$

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

$$\int e^{0.025t} \sin t \, dt = e^{0.025t} (-\cos t) - \int (-\cos t) \cdot 0.025 e^{0.025t} \, dt$$

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

Using integration by part

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

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

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

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

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

$$\text{let } Q = \int e^{0.025t} \sin t \, dt$$

$$Q = -e^{0.025t} \cos t + 0.025 \int e^{0.025t} \sin t \, dt - 0.025 Q$$

$$Q + 0.00625 Q = -e^{0.025t} \cos t + 0.025 e^{0.025t} Q$$

$$1.00625 Q = -e^{0.025t} \cos t + 0.025 e^{0.025t} Q$$

$$1.00625 Q = -e^{0.025t} (\cos t - 0.025)$$

$$Q = \frac{-e^{0.025t} (\cos t - 0.025)}{1.00625} + C$$

$$y = 2000 - \frac{50}{1.00625} (\cos t - 0.025 \sin t) + \frac{50C}{e^{0.025t}}$$

$$\text{When } y = \frac{150}{100} \quad t = 0$$

$$150 = 2000 - \frac{50}{1.00625} (1 - 0) + \frac{50C}{1}$$

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

$$150 = 1950.032 + 50C$$

$$50C = 150 - 1950.032$$

$$C = -36.0064$$

$$Q = \frac{-e^{0.025t}}{1.00625} (\cos t - 0.025) + C$$

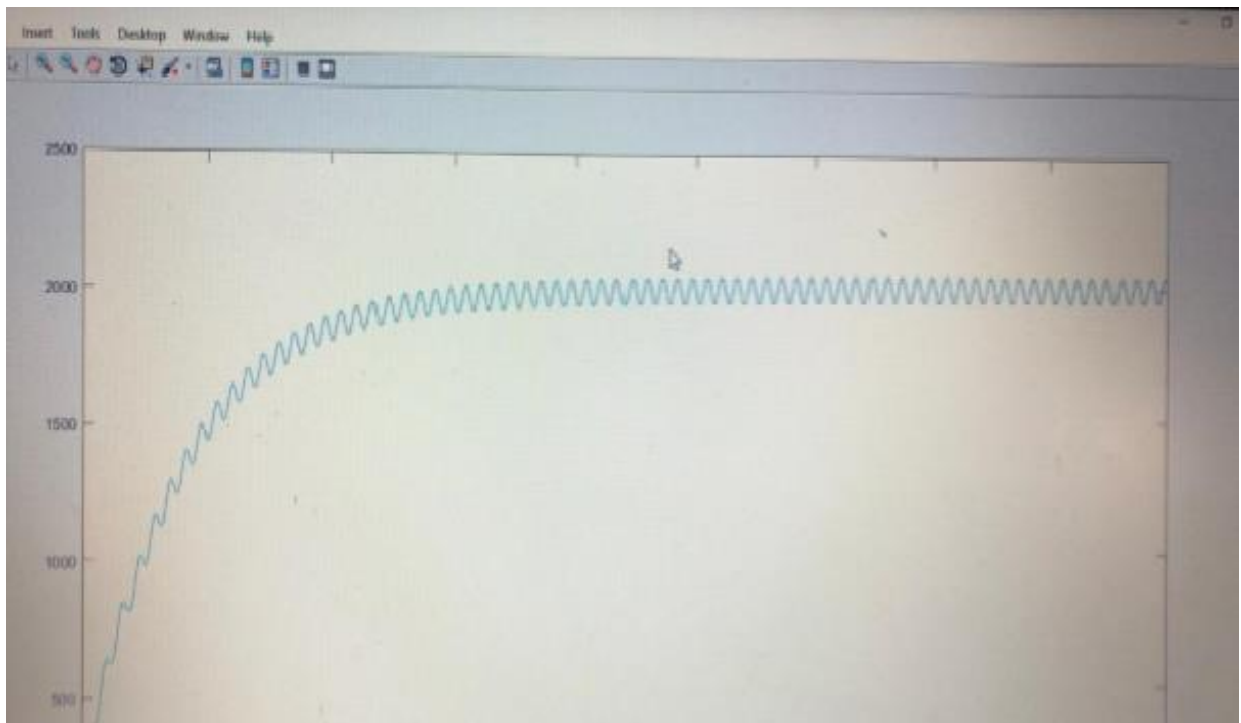
$$\int e^{0.025t} \sin t \, dt = \frac{-e^{0.025t}}{1.00625} (\cos t - 0.025) + C$$

Pod 05 lib
1 = 1.17(t)

$$\therefore y e^{0.025t} = 50 \left[\frac{e^{0.025t}}{0.025} - \frac{e^{0.025t}}{1.000625} (cost - 0.025)t + C \right]$$
$$y e^{0.025t} = 2000 e^{0.025t} - 50 \frac{e^{0.025t}}{1.000625} (cost - 0.025)t$$

Divide through by $e^{0.025t}$

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



```

1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - syms s t
6 - ans = dsolve('Dm+0.025*m=50+50*sin(t)', 'm(0)=150')
7 - t=0:0.5:4.50
8 - tn=subs(ans,t)
9 - plot(t,tn)

```

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Command Window

New to MATLAB? See resources for [Getting Started](#).

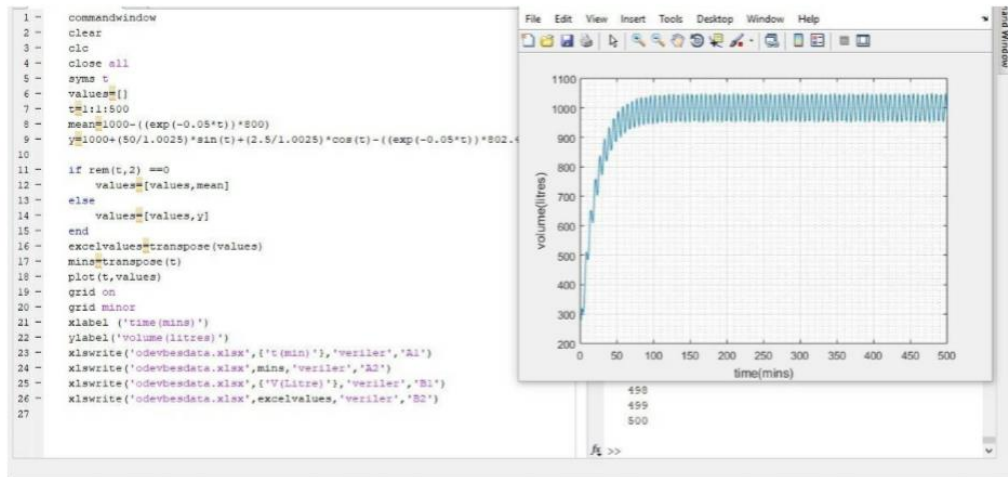
445.5000 446.0000 446.5000 447.0000 447.5000 448.0000 448.5000 449.0000 449.5000 450.0000

tn =

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

fx >>

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odevbesdata - Microsoft Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW

B2 279.96391410068

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	t(min)	V(Litre)																		
2	1	279.9639																		
3	2	318.1907																		
4	3	313.8601																		
5	4	303.601																		
6	5	327.9009																		
7	6	393.3593																		
8	7	469.1423																		
9	8	511.0566																		
10	9	506.5922																		
11	10	484.0395																		
12	11	487.1398																		
13	12	534.9268																		
14	13	604.2824																		
15	14	651.2431																		
16	15	651.4694																		
17	16	622.6706																		
18	17	608.3678																		
19	18	637.9229																		
20	19	699.585																		
21	20	751.3315																		
22	21	759.541																		
23	22	729.9392																		
24	23	702.3679																		
25	24	714.1865																		
26	25	765.9535																		
27	26	820.9421																		
28	27	838.9333																		
29	28	813.2194																		
30	29	776.7951																		

veriler Sheet2

READY AVERAGE: 968.63827% COUNT: 500 SUM: 438419.0138