

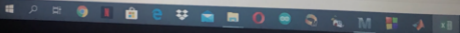
UPDATES AVAILABLE Updates for Office are ready to be installed, but first we need to close some apps. Update now

P17 ✕ ✓ fx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	T[min]	V[litre]												
2	1	239.0165												
3	2	276.1301												
4	3	311.4336												
5	4	345.0154												
6	5	376.9594												
7	6	407.3454												
8	7	436.2495												
9	8	463.744												
10	9	489.8975												
11	10	514.7755												
12	11	538.4402												
13	12	560.9507												
14	13	582.1634												
15	14	602.7318												
16	15	622.1068												
17	16	640.5368												
18	17	658.0681												
19	18	674.7443												
20	19	690.6072												
21	20	705.6964												
22	21	720.0498												
23	22	733.7031												
24	23	746.6906												
25	24	759.0446												
26	25	770.7962												

veriler

Ready



6 ENGINEERING MATHS ASSIGNMENT
 MATHS NO: 18/EN/405/015 (MECHATRONICS)
 NAME: EJIM CHISOM PRECIOUS

QUESTION 1

a) Applying the balance law,

(Accumulation) = (Input rate) - (Output rate from system)
 System

Thus, $\frac{dM}{dt} = M_{in} - M_{out}$

but $M_{in} = 50 \frac{\text{gal}}{\text{min}} \times (1 + \sin t) \frac{\text{L}}{\text{gal}}$

$M_{out} = 50(1 + \sin t) \frac{\text{L}}{\text{min}}$

$\frac{30 \text{ gal}}{1000 \text{ gal}} = 0.03 = 2.5\%$

Thus, $M_{out} = 2.5\%$ of M

by $\frac{dM}{dt} = 50(1 + \sin t) \frac{\text{L}}{\text{min}} - 2.5\% M \frac{\text{L}}{\text{min}}$

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

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

$\frac{dM}{dt} + 0.025M = 50(1 + \sin t)$

Using linear equation method,

$IF = e^{\int P dt}$

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

$IF = e^{\int 0.025 dt} = e^{0.025t}$

$M \cdot IF = \int Q \cdot IF dt$

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

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

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

$M \cdot e^{0.025t} = \frac{1}{0.025} e^{0.025t} + \int e^{0.025t} \sin t dt$

$M \cdot e^{0.025t} - \frac{1}{0.025} e^{0.025t} = \int e^{0.025t} \sin t dt$

$M - \frac{1}{0.025} = \int e^{0.025t} \sin t dt$ (1)

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

$u v - \int u' v dt$

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

$du = 0.025 e^{0.025t}$, $v = -\cos t = \int dv$

Substituting,

$$-e^{0.025t} \cos t - \int 0.025 e^{0.025t} \cos t dt + \int 0.025 e^{0.025t} \cos t dt = 0$$

Putting (2) in (1)

$$\frac{0.025 e^{0.025t} \cos t}{50} - \frac{0.025 e^{0.025t} \cos t}{50} - \frac{0.025 e^{0.025t} \cos t}{50} + \frac{0.025 e^{0.025t} \cos t}{50} = 0$$

Dividing through by $e^{0.025t}$

$$\frac{0.025 \cos t}{50} - \frac{0.025 \cos t}{50} + \frac{0.025 \cos t}{50} - \frac{0.025 \cos t}{50} = 0$$

Solving $\int e^{0.025t} \cos t dt$

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

$v = \int dv = \sin t$

$u v - \int u' v dt$

$e^{0.025t} \sin t - \int 0.025 e^{0.025t} \sin t dt$ (4)

Putting (4) in (3)

$\frac{0.025 e^{0.025t} \sin t}{50} - \frac{0.025 e^{0.025t} \sin t}{50} = 0$

$\frac{0.025 e^{0.025t} \sin t}{50} - \frac{0.025 e^{0.025t} \sin t}{50} = 0$

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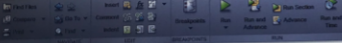
$\frac{0.025 e^{0.025t} \sin t}{50} - \frac{0.025 e^{0.025t} \sin t}{50} = 0$

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C > Users > Ejm Chinom

Editor - C:\Users\Ejm Chinom\secondry.m

```

1 - commandwindow
2 - clear
3 - c1c
4 - close all
5 - syms m t
6 - m = solve('Dm + (0.025*m) = 50*(1+sin(t))', 'm(0)=150')
7 - t = 0:0.5:450
8 - mn = subs(m, t)
9 - plot(t, mn, 'red')
10 - xlabel('time (min)')
11 - ylabel('amount of salt in tank (lb)')
12 - grid on
13 - grid minor

```

Command Window

```

450.0000

mn =

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

```

Workspace

Name	Value
m	
mn	
t	

File folder

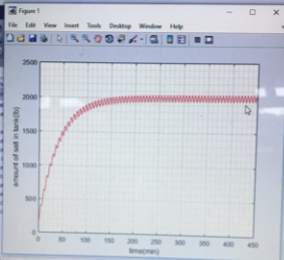
Name

- 3D Objects
- AppData
- Application Data
- Contacts
- Cookies
- Desktop
- Documents
- Downloads
- Favorites
- IntelGraphicsProfiles
- Links
- Local Settings
- MicrosoftEdgeBackups
- Music
- My Documents
- NetHood
- OneDrive
- Pictures
- PortHood
- Recent
- Roaming
- Saved Games
- Searches
- SentTo
- Start Menu
- Templates

```

1 - coms
2 - clea
3 - cio
4 - clos
5 - sym
6 - wda
7 - t=0:
8 - wne
9 - plot
10 - xle
11 - yle
12 - grid
13 - grid

```



Command Window

```

450.0000

m =

[ 150, 2000 - (2000*1601*(1/2)*cos(atan(1/40) + 1/2))/1601 - (2981550*exp(-1/80))/1601, 2000 -

```

Search Documentation

Workspace

Name	Value
m	7x1
min	1x1
t	1x1



C:\Users\Ejm Choum

Command Window

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427.5000 428.0000 428.5000 429.0000 429.5000 430.0000 430.5000 431.0000 431.5000
```

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Column 865 through 873
```

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432.0000 432.5000 433.0000 433.5000 434.0000 434.5000 435.0000 435.5000 436.0000
```

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Column 874 through 882
```

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436.5000 437.0000 437.5000 438.0000 438.5000 439.0000 439.5000 440.0000 440.5000
```

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Column 883 through 891
```

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441.0000 441.5000 442.0000 442.5000 443.0000 443.5000 444.0000 444.5000 445.0000
```

```
Column 892 through 900
```

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

```
Column 901
```

```
450.0000
```

```
nn =
```

```
[ 150, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1/2))/1601 - (288180*exp(-1/80))/1601, 2000 - (2000*1601^(1/2)*cos(atan(1/40) + 1))/1601
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```
Editor - C:\Users\Ejim Chisom\ejimassignmentnew.m
mathassignmentcurrently.m x secondtry.m x ejimassignmentnew.m x justcrosscheck.m x +
1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - t=1:1:500
6 - y=((50/0.05)+ ((50*sin(t)/1.0025))+ ((50*0.05*cos(t))/1.0025))- (802.49*exp(-0.05*t))
7 - plot(t,y)
8 - hold on
9 - tm=0:1:500
10 - ym=((1000)-(800*exp(-0.05*tm)))
11 - hold off
12 - grid on
13 - grid minor
14 - xlabel('t (min)')
15 - ylabel('v(litre)')
16 - col_header=['T(min)', 'V(litre)']
17 - xlswrite('odevbesdata.xlsx', [t(:),y(:)], 'veriler', 'A2')
18 - xlswrite('odevbesdata.xlsx', [tm(:),ym(:)], 'veriler', 'A2')
19 - xlswrite('odevbesdata.xlsx', col_header, 'veriler', 'A1')
```

Workspace

Name

col_header

t

tm

y

ym

script