

EKOK NZIE OKPOKAM
 18/ENG05/045
 MECHATRONICS ENG
 ENG MATHS ASSIGN V

1A&B

OKPOKAM EKOK NZIE
 18/ENG05/045
 MECHATRONICS

a) $\frac{dm}{dt} = m_{in} - m_{out}$

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

$m_{out} = \frac{30}{1200} = 0.025$ ie 2.5% of m
 thus

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

b) $\frac{dm}{dt} + 0.025m = 50(1 + \sin t)$
 using integrating factor
 $e^{\int P dx} = e^{0.025m}$

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

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

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

Solving
 $50 \int e^{0.025t} = \frac{50e^{0.025t}}{0.025}$

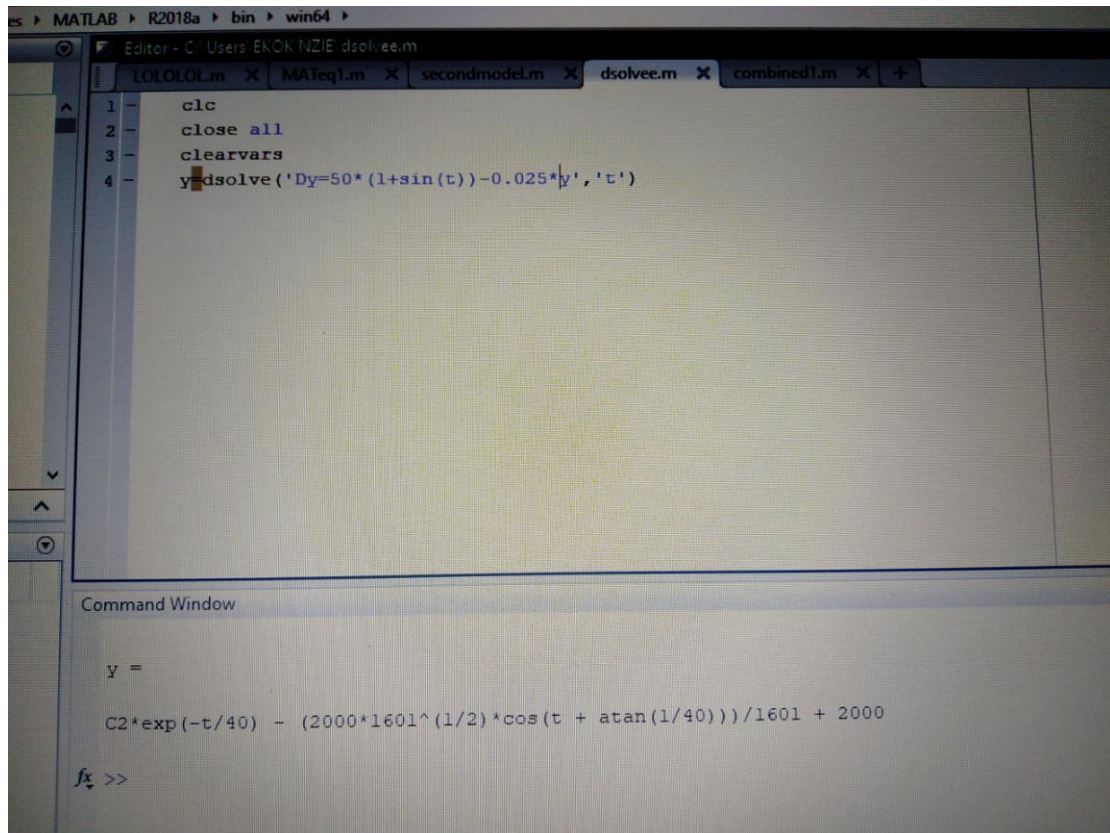
So $\int \sin t e^{0.025t} dt$
 using integrating by part

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

$\int \sin t e^{0.025t} = \frac{0.025 \sin t e^{0.025t} - \cos t \cdot e^{0.025t}}{1.000625}$

$m = \frac{2000e^{0.025t} + 49.97(0.025 \sin t e^{0.025t} - \cos t e^{0.025t}) + C}{e^{0.025t}}$

1C

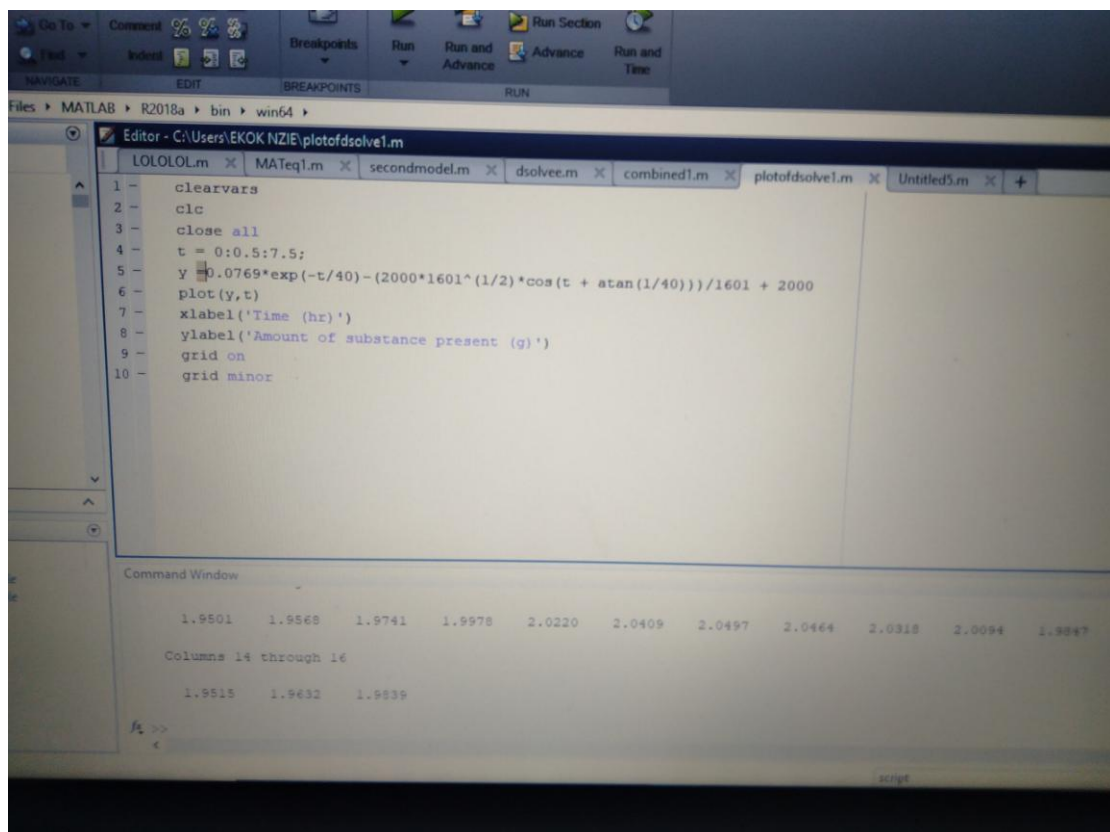


The image shows a MATLAB Editor window with the following code in the editor:

```
1 clc
2 close all
3 clearvars
4 y=dsolve('Dy=50*(1+sin(t))-0.025*y','t')
```

The Command Window displays the result of the dsolve function:

```
y =
C2*exp(-t/40) - (2000*1601^(1/2)*cos(t + atan(1/40)))/1601 + 2000
fx >>
```

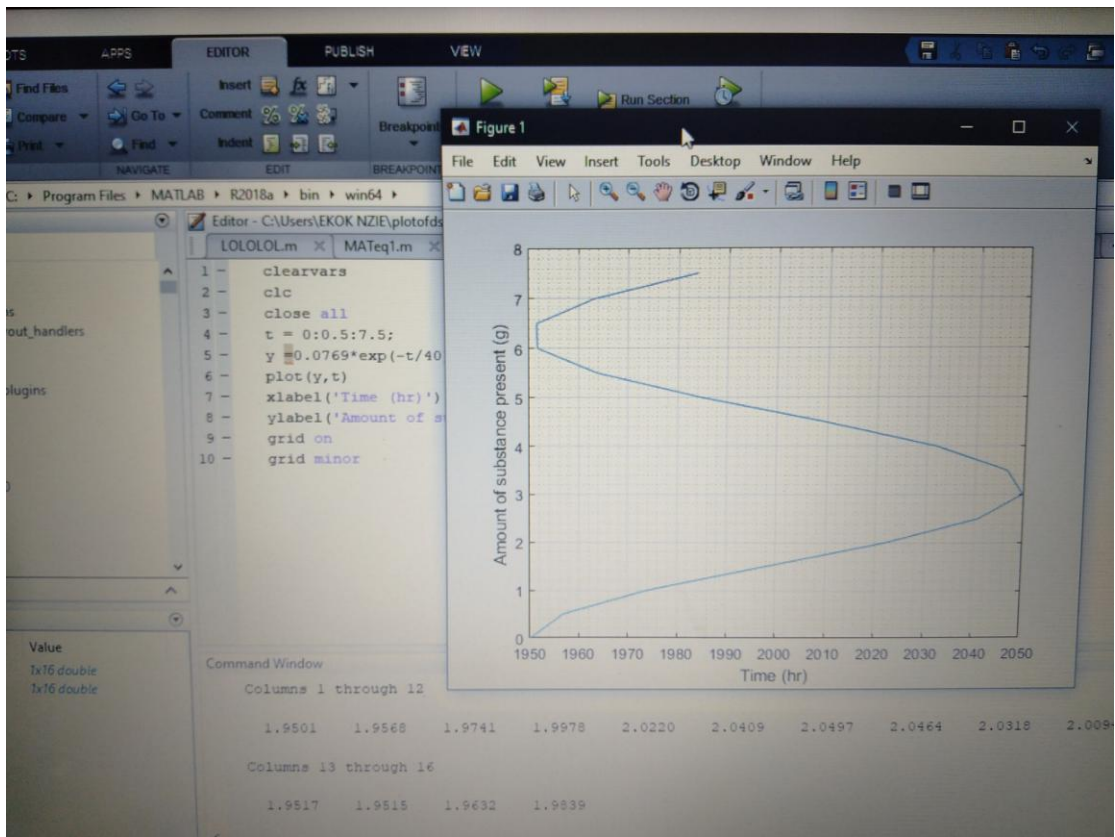


The image shows a MATLAB Editor window with the following code in the editor:

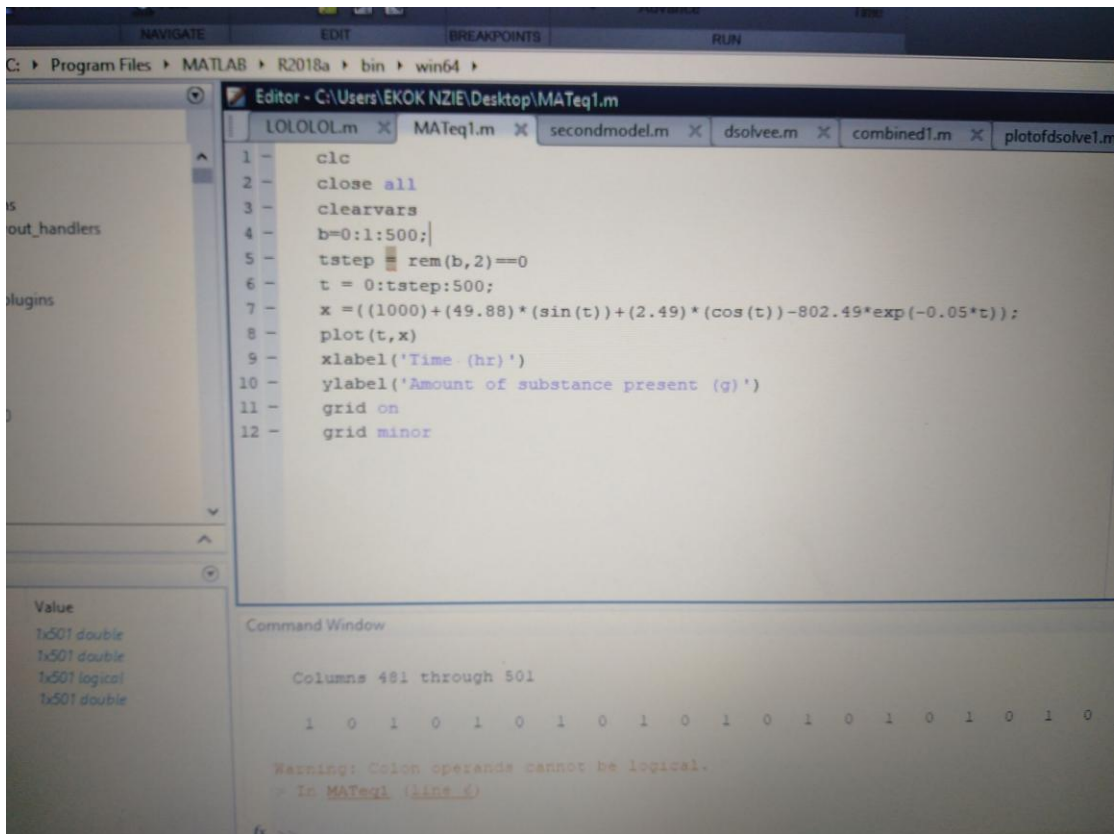
```
1 clearvars
2 clc
3 close all
4 t = 0:0.5:7.5;
5 y = 0.0769*exp(-t/40) - (2000*1601^(1/2)*cos(t + atan(1/40)))/1601 + 2000
6 plot(y,t)
7 xlabel('Time (hr)')
8 ylabel('Amount of substance present (g)')
9 grid on
10 grid minor
```

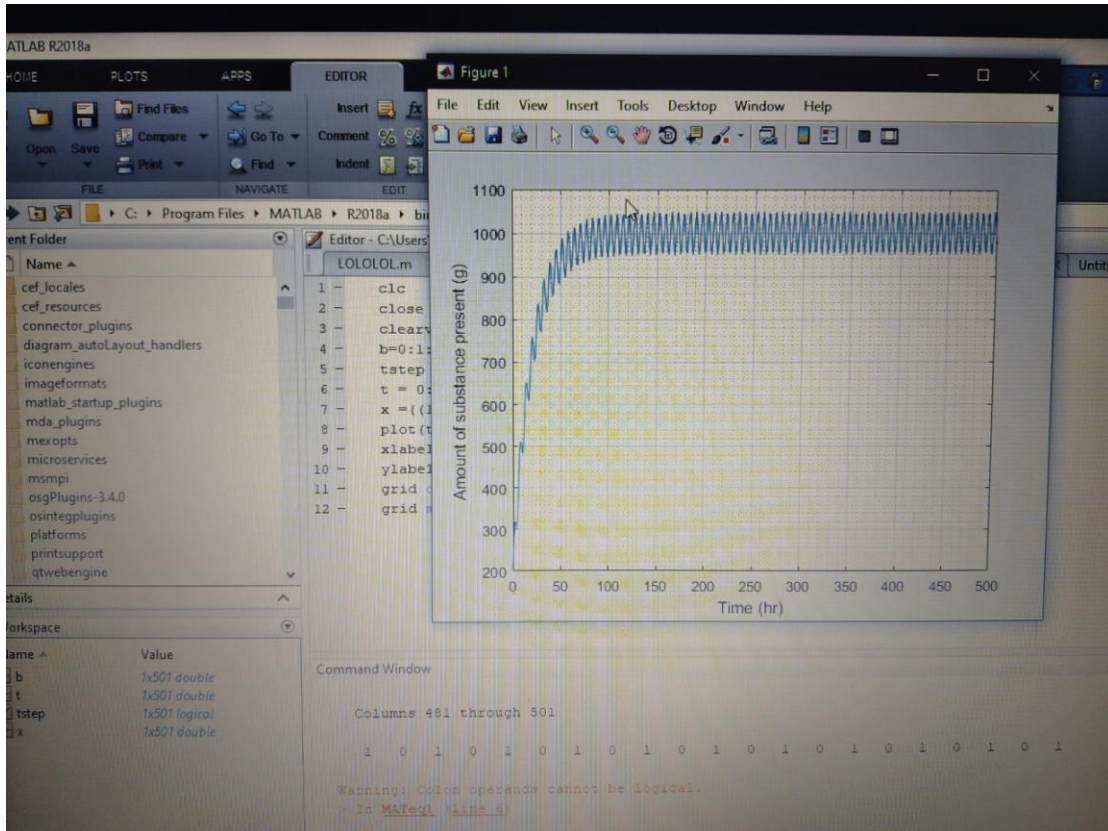
The Command Window displays the following output:

```
1.9501 1.9568 1.9741 1.9978 2.0220 2.0409 2.0497 2.0464 2.0318 2.0094 1.98x7
Columns 14 through 16
1.9515 1.9632 1.9839
fx >>
```



2A





FILE NAVIGATE EDIT BREAKPOINTS RUN

C:\Program Files\MATLAB\R2018a\bin\win64

Editor - C:\Users\EKOK NZIE\secondmodel.m

LOLOLOL.m x MATeq1.m x secondmodel.m x dsolvee.m x combined1.m x plotofdsolve1.m

```

1 - clearvars
2 - clc
3 - close all
4 - b=0:1:500;
5 - tstep rem(b,2)==1
6 - t = 0:tstep:500;
7 - y = (1000-800*exp(-0.05*t));
8 - plot(t,y)
9 - xlabel('Time (hr)')
10 - ylabel('Amount of substance present (g)')
11 - grid on
12 - grid minor

```

Command Window

Columns 481 through 501

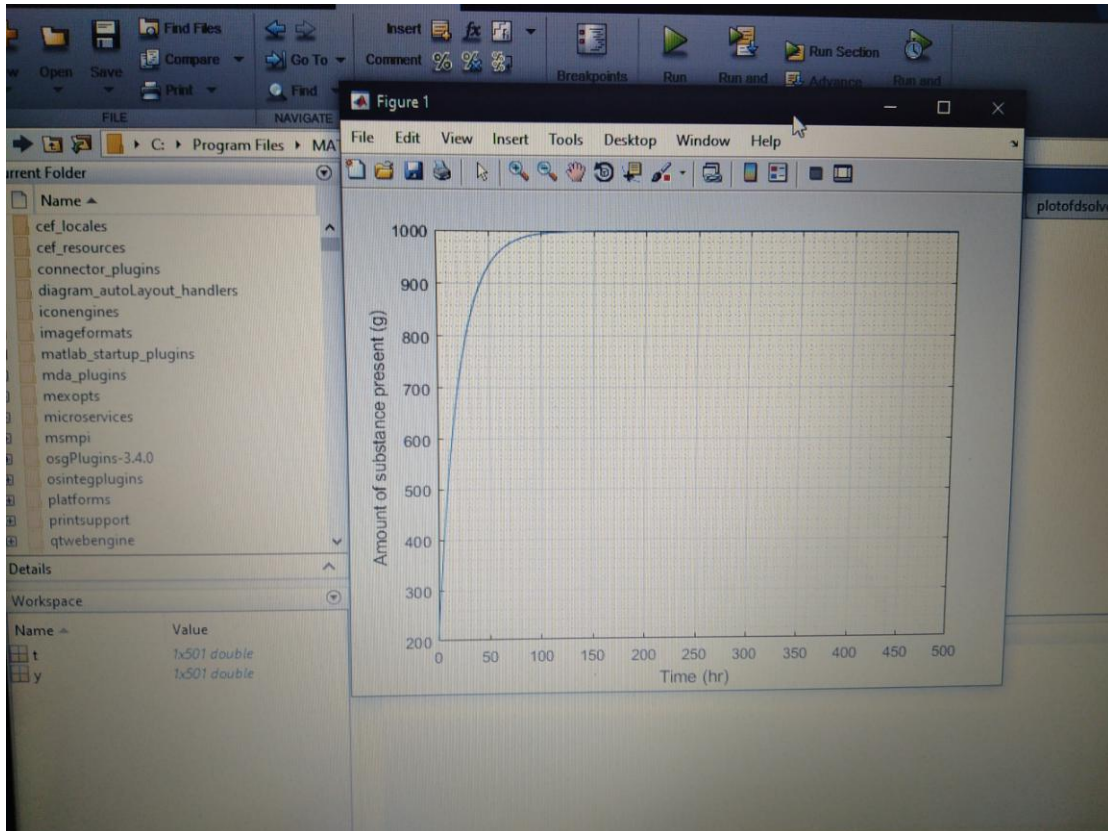
```

1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0

```

Warning: Colon operands cannot be logical.
 -> In MATeq1 (line 8)

f1 >>



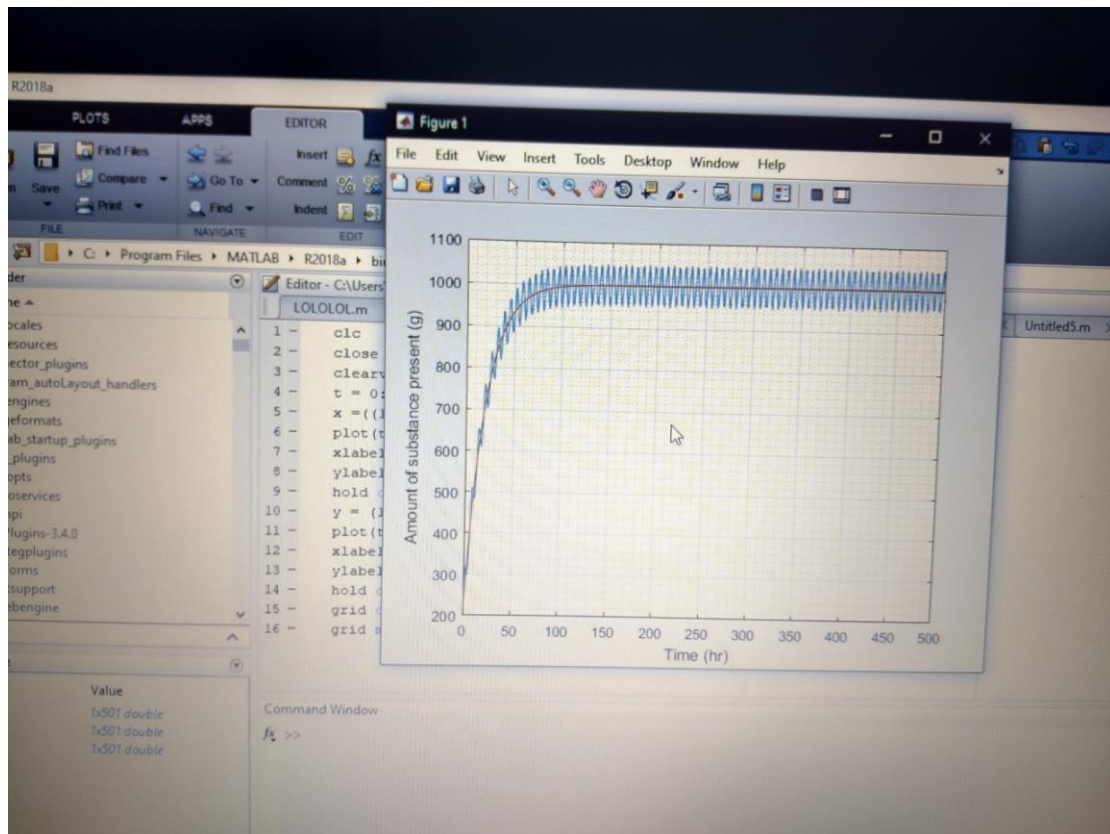
2B

```

Editor - C:\Users\EKOK NZIE\combined1.m
LOLOLOL.m x MATeq1.m x secondmodel.m x dsolvee.m x combined1.m x plotofdsolve1.m x Untitled
1 - clc
2 - close all
3 - clearvars
4 - t = 0:1:500;
5 - x = (1000)+(49.88)*(sin(t))+(2.49)*(cos(t))-802.49*exp(-0.05*t);
6 - plot(t,x)
7 - xlabel('Time (hr)')
8 - ylabel('Amount of substance present (g)')
9 - hold on
10 - y = (1000-800*exp(-0.05*t));
11 - plot(t,y)
12 - xlabel('Time (hr)')
13 - ylabel('Amount of substance present (g)')
14 - hold off
15 - grid on
16 - grid minor

Command Window
fx >>

```



2C

```
- column={'t (min)', 'V (litre)'};
- xlswrite('odevbesdata', [t(:), V(:)], 'Veriler', 'A2');
- xlswrite('odevbesdata', column, 'Veriler', 'A1');
```