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M/Sol902/023

Chemical Engineering.

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

$$m_{in} = 50 \times (1 + \sin t)$$

$$m_{out} = 30 \times \left( \frac{m}{120 + 2t} \right)$$

$$\frac{dm}{dt} = 50(1 + \sin t) - \frac{3m}{120 + 2t}$$

$$\frac{dm + 3m}{dt \cdot 120 + 2t} = 50(1 + \sin t)$$

using I.F

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

$$P = \frac{3}{120 + 2t}, \quad Q = 50(1 + \sin t)$$

$$\int P dt = 3 \ln(120 + 2t)$$

$$I.F = e^{\int P dt} = e^{3 \ln(120 + 2t)} = (120 + 2t)^3$$

$$I.F = (120 + 2t)^3$$

$$y \cdot I.F = \int Q \cdot I.F dt$$

$$m(120 + 2t)^3 = 50 \int (120 + 2t)^3 (1 + \sin t) dt$$

- Oktober / Febr

- 19/02/2023

- Chemical Engineering

$$z = \frac{2t^4 + 48t^3 + 43200t^2 + 1728000t - \cos t (120+2t)^2 + 68t}{(120+2t)^2}$$

$$M = \frac{(2t^4 + 48t^3 + 43200t^2 + 1728000t) - \cos t + 68 \sin t + C}{(120+2t)^2}$$

- at  $t=0$

-  $m=150$

$$150 = 50 \left( -1 + \frac{C}{(120)^2} \right)$$

$$150 = -50 + \frac{50C}{120^2}$$

$$C = 518399$$

$$M = \frac{(2t^4 + 48t^3 + 43200t^2 + 1728000t) - \cos t + 68 \sin t + 518399}{(120+2t)^2}$$

$$+ \frac{518399}{(120+2t)^2}$$

```
1 - commandwindow
2 - clear all
3 - clc
4 - syms m(t) t
5 - eqn = diff(m,t)+ 3*m(t)/(120+2*t) == (50*(1+sin(t)))
6 - s = dsolve(eqn,m(0)==150)
7 - y=simplify(s)
8 - t=0:0.5:450
9 - plot(subs(y,t))
10 - grid on
11 - grid minor
12 - xlabel('Time(min)') I
13 - ylabel('Amount of Salt(Lb)')
14
15
```

Command Window

440.0000 440.5000 441.0000 441.5000 442.0000 442.5000 443.0000 443.5000 444.0000 444.5000 445.0000

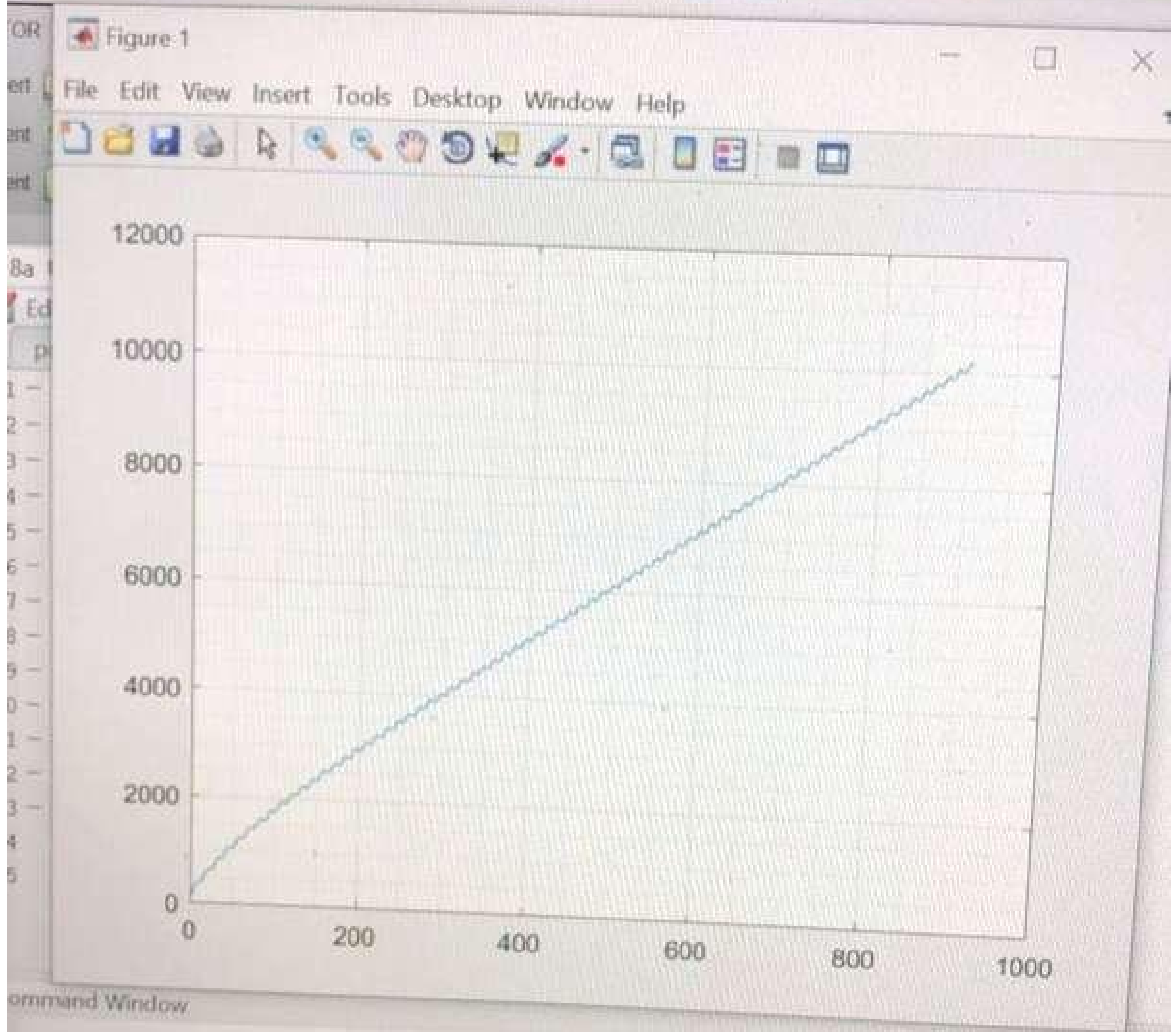
Columns 892 through 901

445.5000 446.0000 446.5000 447.0000 447.5000 448.0000 448.5000 449.0000 449.5000 450.0000

fx

script

Ln 14 Col 1



Command Window

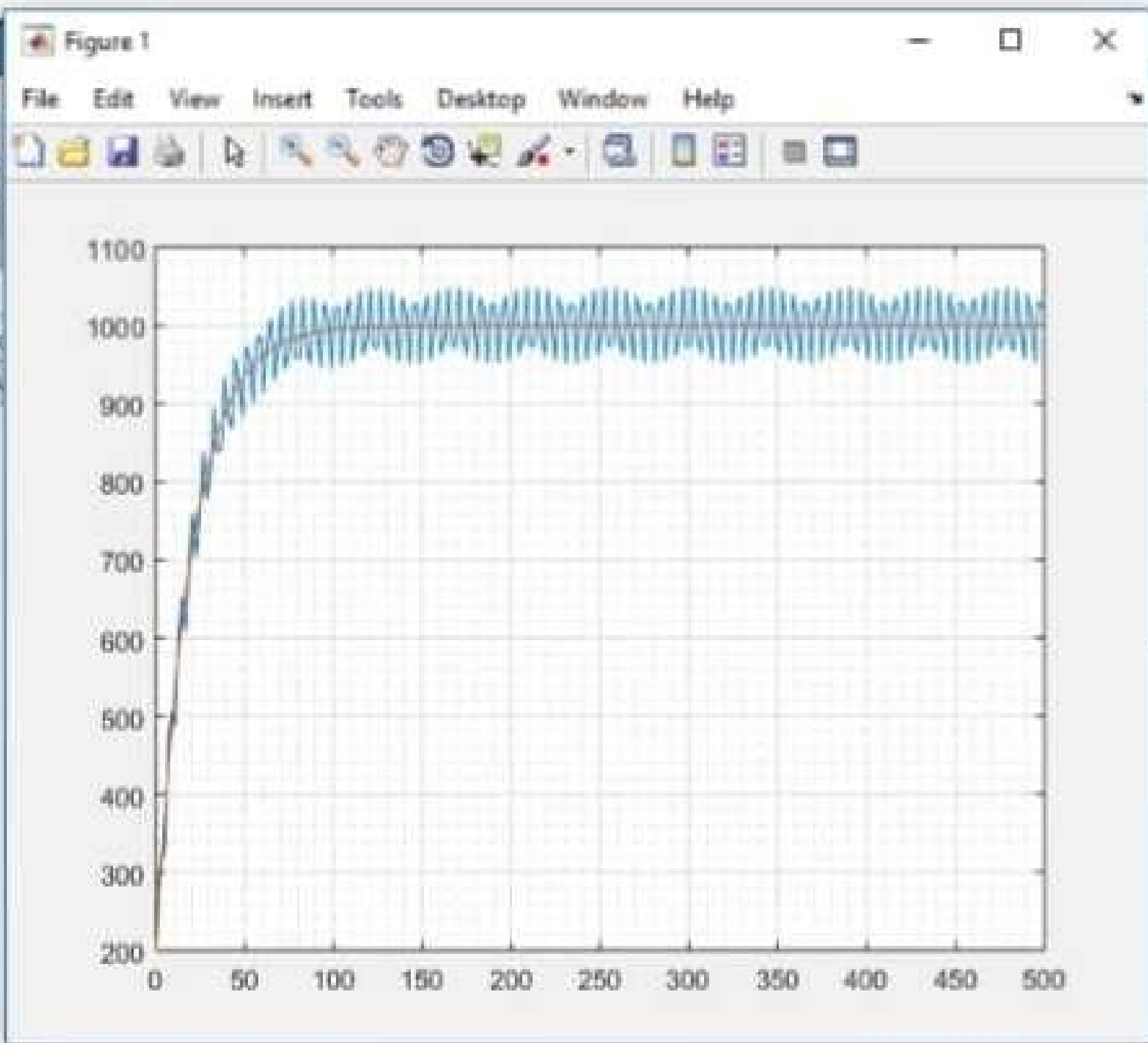
440.0000 440.5000 441.0000 441.5000 442.0000 442.5000 443.0000 443

Columns 892 through 901

445.5000 446.0000 446.5000 447.0000 447.5000 448.0000 448.5000 449.

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scrip



$\exp(-0.05*t)$

Command Window

script Ln 11 Col 5

9:59 PM  
06/05/2020

```
1 -  commandwindow
2 -  clear
3 -  clc
4 -  close all
5 -  format short g
6 -  syms t
7 -  y=(50/0.05)+((50/1.0025)*sin(t))+((50*0.05/1.0025)*cos(t))- (802.49*exp(-0.05*t))
8 -  ym=1000-(800*exp(-0.05*t))
9 -  T=0:1:500
10 -  T1=T(2:2:500)
11 -  T2=T(1:2:500)
12 -  Y=subs(y,T1)
13 -  Ym=subs(ym,T2)
14 -  mdata('t(minutes)', 'V(litres)'; Y, Ym)
15 -  plot(T1, Y, T2, Ym)
16 -  grid on
17 -  grid minor
```

Name	Value
mdata	2x2 cell
t	1x1 sym
T	1x501 double
T1	1x250 double
T2	1x250 double
y	1x1 sym
Y	1x250 sym
ym	1x1 sym
Ym	1x250 sym