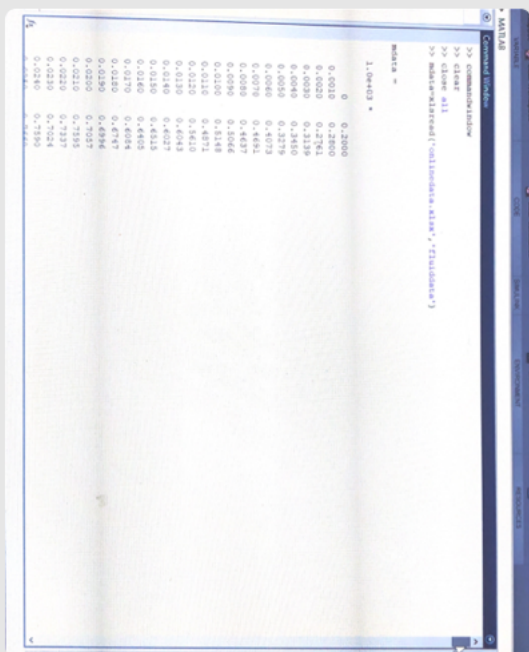


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PROGRAMMING
ENG 224

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```
MATLAB
Command Window
>> commandWindow
>> clear
>> close all
>> save('data.mat','data');
data =
1.0e+03 *
0 0.2000
0.0010 0.2000
0.0020 0.2761
0.0030 0.2139
0.0040 0.2450
0.0050 0.3279
0.0060 0.4073
0.0070 0.4691
0.0080 0.4637
0.0090 0.5066
0.0100 0.5148
0.0110 0.4871
0.0120 0.5610
0.0130 0.6043
0.0140 0.6027
0.0150 0.6315
0.0160 0.6805
0.0170 0.6084
0.0180 0.6747
0.0190 0.6996
0.0200 0.7057
0.0210 0.7395
0.0220 0.7337
0.0230 0.7024
0.0240 0.7390
```

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```
MATLAB Command Window  
>> t=data(1:251,1)  
t =  
0  
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27
```

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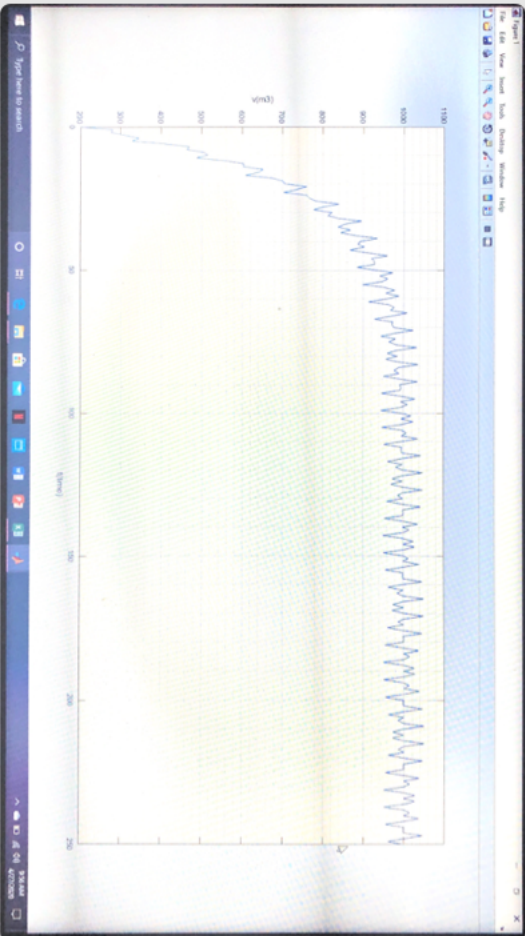
```
parentheses. Otherwise, check for mismatched delimiters.  
>> v=data(1:251,2)  
v =  
1.0e+03 *  
0.2000  
0.2800  
0.3761  
0.3139  
0.3450  
0.3279  
0.4073  
0.4691  
0.4637  
0.5066  
0.5148  
0.4871  
0.5610  
0.6049  
0.6027  
0.6515  
0.6505  
0.6084  
0.6747  
0.6996  
0.7057  
0.7595  
0.7337  
0.7024  
0.7604
```

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```
>> plot(t,v)
>> xlabel('t(time)')
>> ylabel('v(m3)')
>> grid on
>> grid minor
```

1.0000
1.0269
1.0000
0.9505
1.0000
1.0142
1.0000
1.0376
1.0000
0.9545
1.0000
1.0003
1.0000
1.0453
1.0000
0.9620
1.0000

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$$\frac{dT}{dt} \propto (T - T_0)$$

$$\frac{dT}{dt} = k(T - T_0)$$

$$t=0 \quad T=10^\circ$$

$$t=5 \text{ min} \quad T=20^\circ$$

$$T_i \quad T=20$$

$$\frac{dT}{dt} = k(T - T_0)$$

$$t=0 \quad T=10$$

$$dT = k(T - T_0) dt$$

dt

$$(T - T_0) k dt = dT$$

$$\int k dt = \int \frac{dT}{T - T_0}$$

$$kt + C = \ln(T - T_0)$$

$$e^{kt+C} = T - T_0$$

$$e^{kt} \cdot e^C = T - T_0$$

$$e^{kt} \cdot T_0 = T - T_0$$

$$e^{k(0)} \cdot T_0 = T - T_0$$

$$T_0 = T - T_0$$

$$2T_0 = 10$$

$$T_0 = 5^\circ$$

$$T = 20 \quad t = 5 \text{ min} \quad T_0 = 5^\circ$$

$$e^{kt+C} = T - T_0$$

$$e^{k(5)} \cdot 5 = 20 - 5$$

$$5e^{5k} = 15$$

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$$e^{5k} = 3$$

$$5k = \ln 3$$

$$k = \frac{\ln 3}{5}$$

$$k = \underline{0.2197}$$

$$\overline{1.25}$$

$$e^{0.2197t} \cdot 5 = 25 - 5$$

$$5e^{0.2197t} = 20$$

$$e^{0.2197t} = 4$$

$$t = \frac{\ln 4}{0.2197}$$

$$t = 6 \text{ mins}$$