

IFIDI Joshua Teradou

18/ENGG02/044

Computer Engineering

1a Tank contains 1200 gal of water

150 lb is dissolved initially

50 gal runs in per minute (50 gal/min)

each gal is  $(1 + \sin t)$  lb

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

30 gal runs out per minute (30 gal/min)

$\therefore$  % extent of tank running out

$$= \frac{30}{1200} \times 100 = 2.5\%$$

• % of salt running out =  $0.025y$

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

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

$$\frac{dy}{dt} + 0.025y = 50 + 50 \sin t$$

$$\frac{1}{(y - 2000 - 2000 \sin t)} = \int -0.025 dt$$

$$\ln(y - 2000 - 2000 \sin t) = -0.025t + C$$

$$y - 2000 - 2000 \sin t = e^{-0.025t + C}$$

$$y - 2000 - 2000 \sin t = e^{-0.025t} e^C$$

$$y - 2000 - 2000 \sin t = y_0 e^{-0.025t}$$

when  $t=0$ ,  $y=150$

$$150 = -2000 - 2000 \sin(t_0) = y_0 e^{-0.025t}$$

$$150 - 2000 = y_0$$

$$y_0 = -1850$$

$$\therefore y = 2000 - 2000 \sin t = -1850 e^{-0.025t}$$

$$y = 2000 (1 + \sin t) - 1850 e^{-0.025t}$$



MATLAB Drive



IFIDI1Canswer18ENG02044.m

```
1 commandwindow
2 clear
3 clc
4 close all
5 syms m t
6 equ = dsolve('Dm = (50*(1+sin(t)))-
  (0.025*m)', 'm(0)=150')
7 t = 0:(0.5/60):7.5
8 m = subs(equ, t)
9 plot(t,m, 'green')
10 xlabel('time(hrs)')
11 ylabel('amount of subs (lb)')
12 grid minor
13 grid on
```





```
>> IFIDI1Canswer18ENG02044
```

```
t =
```

```
Columns 1 through 4
```

```
0 0.5000 1.0000 1.5000
```

```
Columns 5 through 8
```

```
2.0000 2.5000 3.0000 3.5000
```

```
Columns 9 through 12
```

```
4.0000 4.5000 5.0000 5.5000
```

```
Columns 13 through 16
```

```
6.0000 6.5000 7.0000 7.5000
```

```
m =
```

```
1.0e+03 *
```

```
Columns 1 through 4
```

```
-1.6860 -1.6625 -1.6393 -1.6164
```

```
Columns 5 through 8
```

```
-1.5938 -1.5715 -1.5494 -1.5277
```

```
Columns 9 through 12
```

```
-1.5061 -1.4849 -1.4639 -1.4432
```

```
Columns 13 through 16
```

```
-1.4227 -1.4025 -1.3826 -1.3629
```



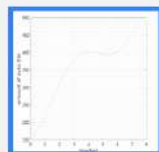
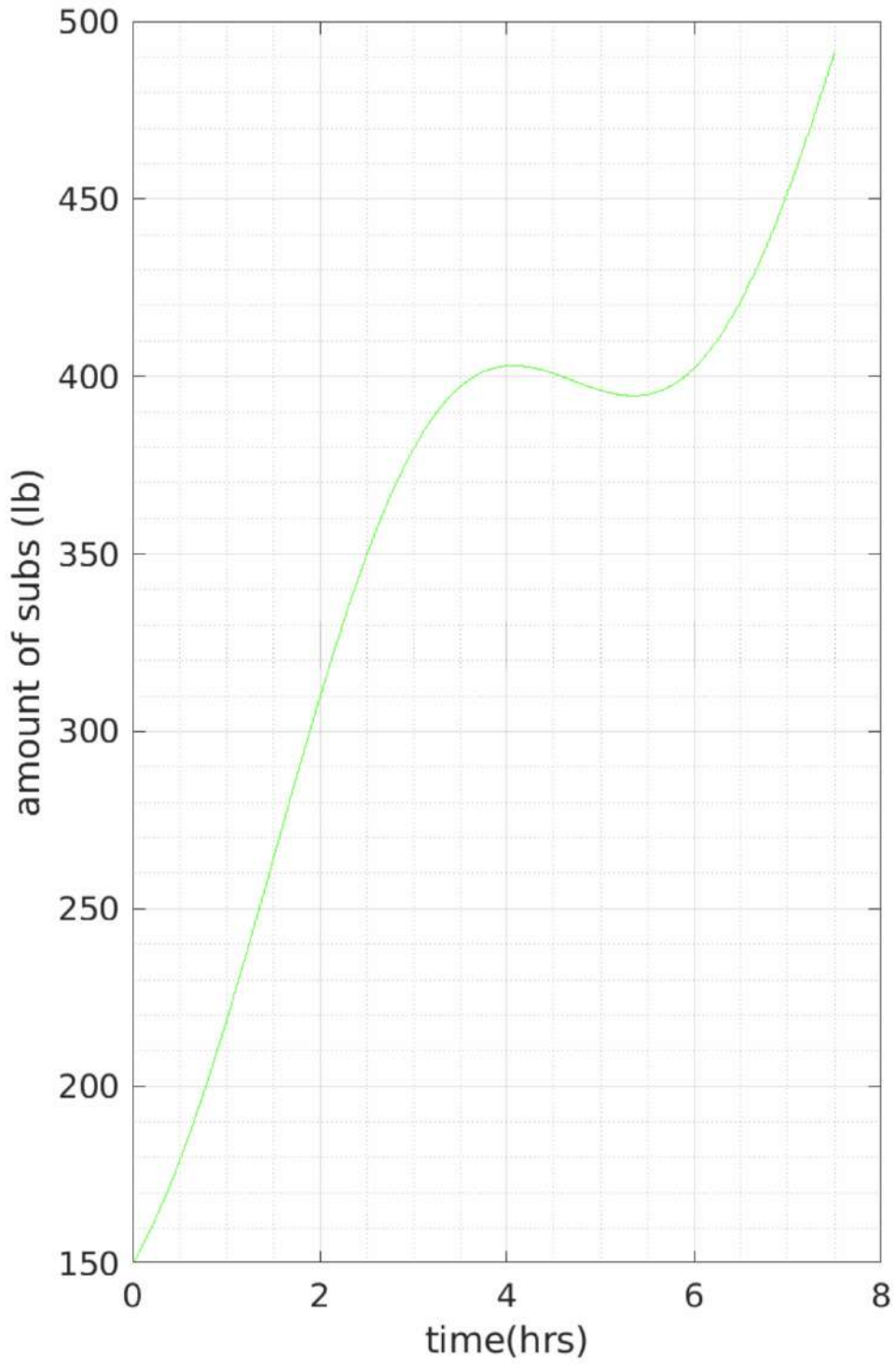
```
>> Enter command here...
```

Done

Show Data Cursor



Figure 1: IFIDI1Canswer18ENG02044





MATLAB Drive



Ifidi2AandBanswer18ENG02044.m\*

```
1 t = 1:2:500
2 y=1000+((50/1.0025)*sin(t))+(((50*0.05)/
  1.0025)*cos(t))-(802.49*exp(-0.05*t))
3 ts = 0:2:500
4 ys =1000-(800*exp(-0.05*ts))
5 plot(t,y)
6 hold on
7 plot(ts,ys)
8 hold off
9 xlabel('amount')
10 ylabel('time(minute)')
11 grid on
12 grid minor
```



```
>> Ifidi2AandBanswer18ENG02044
```

```
t =
```

```
Columns 1 through 7
```

```
1 3 5 7 9 11 13
```

```
Columns 8 through 14
```

```
15 17 19 21 23 25 27
```

```
Columns 15 through 21
```

```
29 31 33 35 37 39 41
```

```
Columns 22 through 28
```

```
43 45 47 49 51 53 55
```

```
Columns 29 through 35
```

```
57 59 61 63 65 67 69
```

```
Columns 36 through 42
```

```
71 73 75 77 79 81 83
```

```
Columns 43 through 49
```

```
85 87 89 91 93 95 97
```

```
Columns 50 through 56
```

```
99 101 103 105 107 109 111
```

```
Columns 57 through 63
```

```
113 115 117 119 121 123 125
```

```
Columns 64 through 70
```

```
127 129 131 133 135 137 139
```

```
>> Enter command here...
```



y =

1.0e+03 \*

Columns 1 through 4

0.2800 0.3139 0.3279 0.4691

Columns 5 through 8

0.5066 0.4871 0.6043 0.6515

Columns 9 through 12

0.6084 0.6996 0.7595 0.7024

Columns 13 through 16

0.7660 0.8389 0.7768 0.8118

Columns 17 through 20

0.8957 0.8369 0.8436 0.9346

Columns 21 through 24

0.8863 0.8664 0.9592 0.9272

Columns 25 through 28

0.8839 0.9726 0.9608 0.8989

Columns 29 through 32

0.9776 0.9878 0.9132 0.9764

Columns 33 through 36

1.0087 0.9279 0.9713 1.0236

Columns 37 through 40

0.9132 0.9764 1.0236 0.9132

>> Enter command here...





ts =

Columns 1 through 7

0 2 4 6 8 10 12

Columns 8 through 14

14 16 18 20 22 24 26

Columns 15 through 21

28 30 32 34 36 38 40

Columns 22 through 28

42 44 46 48 50 52 54

Columns 29 through 35

56 58 60 62 64 66 68

Columns 36 through 42

70 72 74 76 78 80 82

Columns 43 through 49

84 86 88 90 92 94 96

Columns 50 through 56

98 100 102 104 106 108 110

Columns 57 through 63

112 114 116 118 120 122 124

Columns 64 through 70

126 128 130 132 134 136 138

>> Enter command here...



ys =

1.0e+03 \*

Columns 1 through 4

0.2000 0.2761 0.3450 0.4073

Columns 5 through 8

0.4637 0.5148 0.5610 0.6027

Columns 9 through 12

0.6405 0.6747 0.7057 0.7337

Columns 13 through 16

0.7590 0.7820 0.8027 0.8215

Columns 17 through 20

0.8385 0.8539 0.8678 0.8803

Columns 21 through 24

0.8917 0.9020 0.9114 0.9198

Columns 25 through 28

0.9274 0.9343 0.9406 0.9462

Columns 29 through 32

0.9514 0.9560 0.9602 0.9640

Columns 33 through 36

0.9674 0.9705 0.9733 0.9758

Columns 37 through 40

>> Enter command here...

Done

Show Data Cursor



Figure 1: Ifidi2AandBanswer18ENG02044

