

Tank contains 1200 gal. of brine
150 lb of salt dissolved initially

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

Each gallon contains $(1 + \sin t)$ gal of salt + $[(1 + \sin t) \text{ gal} / 16]$

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

~~90 conf.~~ 30 gal. of brine run out per minute

\therefore % content of tank running out per minute

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

% salt running out = $0.025y = m_{\text{out}}$

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

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

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

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

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

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

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

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

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

$$(150 - 2000 - 2000 \sin(0)) = y_0 e^{-0.025(0)}$$

$$150 - 2000 = y_0$$

$$y_0 = -1850$$

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

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

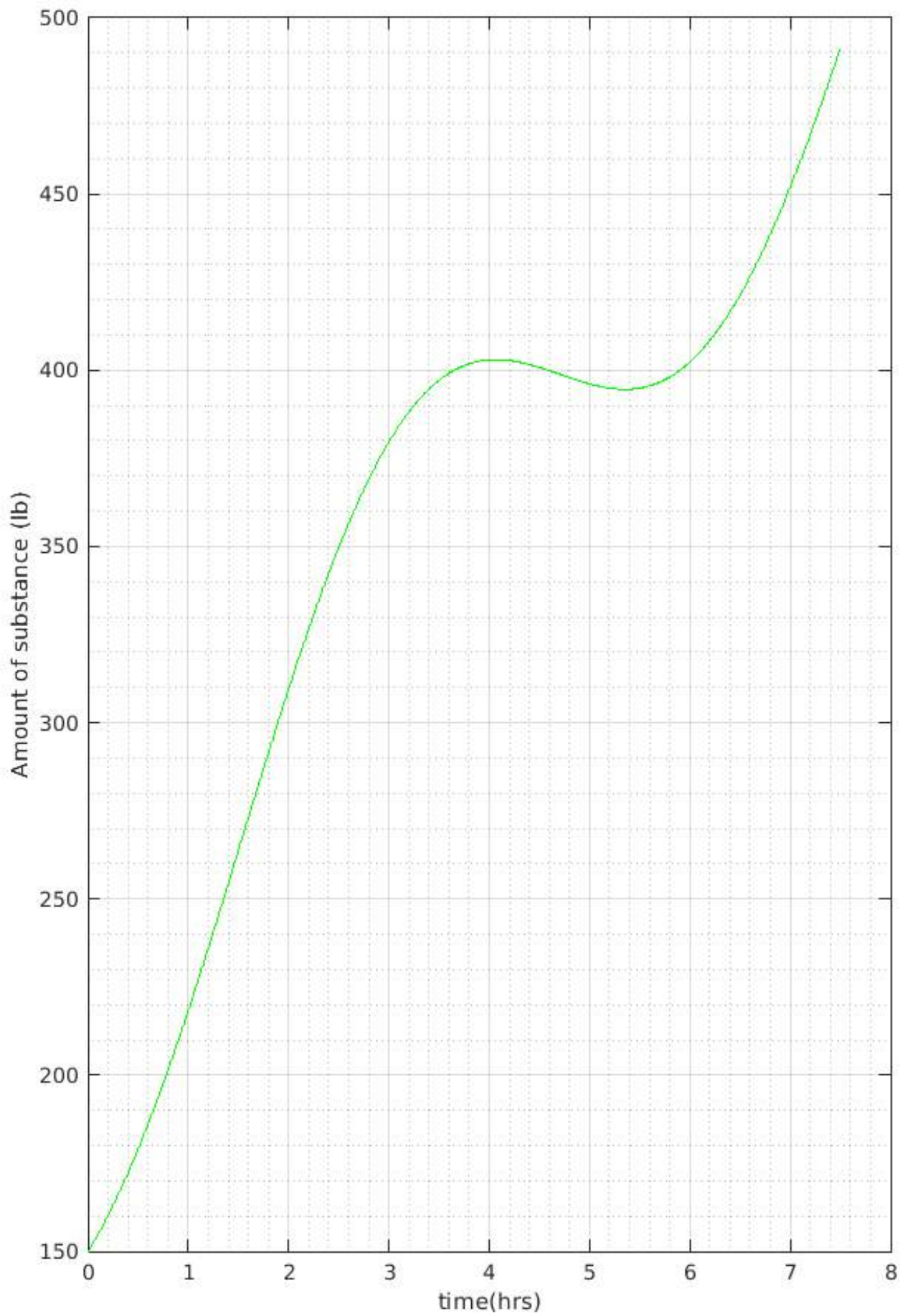


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>> syms m t
    eqn = dsolve('Dm = (50*(1+sin(t)))-
    (0.025*m)', 'm(0) = 150')
    t = 0:(0.5/60):7.5
    m = subs(eqn, t)
    plot(t, m, 'green')
    xlabel('time(hrs)')
    ylabel('Amount of substance (lb)')
    grid on
    grid minor

...
01^(1/2)*cos(atan(1/40) + 79/24))/
1601 - (2881850*exp(-79/960))/1601,
2000 - (2000*1601^(1/2)*cos(atan(1/40)
+ 33/10))/1601 -
(2881850*exp(-33/400))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40)
+ 397/120))/1601 -
(2881850*exp(-397/4800))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40)
+ 199/60))/1601 -
(2881850*exp(-199/2400))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40)
+ 133/40))/1601 -
(2881850*exp(-133/1600))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40) +
10/3))/1601 - (2881850*exp(-1/12))/1601,
2000 - (2000*1601^(1/2)*cos(atan(1/40)
+ 401/120))/1601 -
(2881850*exp(-401/4800))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40)
+ 67/20))/1601 -
(2881850*exp(-67/800))/1601, 2000
- (2000*1601^(1/2)*cos(atan(1/40)
>>
    
```







```
>> t = 1:2:500
y=1000+((50/1.0025)*sin(t))+
((50*0.05)/1.0025)*cos(t)-
(802.49*exp(-0.05*t))
ta = 0:2:500
ya=1000-(800*exp(-0.05*ta))
plot(t, y)
hold on
plot(ta, ya)
hold off
xlabel('amount')
ylabel('time(min)')
grid on
grid minor
```

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t =
```

```
Columns 1 through 6
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1 3 5 7 9 11
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Columns 7 through 12
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13 15 17 19 21 23
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Columns 13 through 18
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25 27 29 31 33 35
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Columns 19 through 24
```

```
37 39 41 43 45 47
```

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Columns 25 through 30
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>>
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