

ALTERNATIVE METHOD  
IS/EVALUATION  
EFFECTIVE

$$\frac{dy}{dt} = 50 \cos t \sin t - 0.025y \quad Q = e^{-0.025t}, \quad dV = \cos t$$

$$dV = 0.025 e^{-0.025t} \quad V = \sin t$$

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

$$\int \sin t \cdot 0.025 e^{-0.025t} \left[ \cos t + 0.025 \int e^{-0.025t} \sin t \right]$$

Using the linear equation method  
 $\frac{dy}{dx} + Py = Q$   
 $\therefore P = 0.025, \quad Q = 50 \cos t \sin t$

$$\therefore \int P \cdot dt = 0.025t$$

$$\int \cdot F = e^{0.025t}$$

$$\int \cdot F = e^{-0.025t}$$

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

$$y e^{-0.025t} = \int 50 \cos t \sin t e^{-0.025t} dt$$

$$y e^{-0.025t} = 50 \int \cos t \sin t e^{-0.025t} dt$$

$$y e^{-0.025t} = 50 \left[ \int \cos t e^{-0.025t} dt + \int \sin t e^{-0.025t} dt \right]$$

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using integration by part  
 $\int u \cdot dv = uv - \int v \cdot du$



$$y e^{0.025t} = 50 \left[ \frac{e^{0.025t}}{0.025} - \frac{e^{0.025t} (\cos t - 0.025) + c}{1.000625} \right]$$

$$y e^{0.025t} = \frac{2000 - 50 (\cos t - 0.025) + 50c}{1.000625 e^{0.025t}}$$

$$y = \frac{2000 - 50 (\cos t - 0.025) + 50c}{1.000625 e^{0.025t}}$$

When  $y = 150$ ,  $t = 0$

$$150 = \frac{2000 - 50 (1 - 0) + 50c}{1.000625}$$

$$150 = 2000 - 49.968 (1) + 50c$$

$$150 = 1950.032 + 50c$$

$$-1800.032 = 50c$$

$$c = -36.00064$$

$\therefore$  From  $\frac{dy}{dt} = y_{in} - y_{out}$

$$\frac{dy}{dt} = 50(1 + \sin t) - 2.5\% \text{ of } y.$$

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

$\therefore$  By separating variables,

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

multiply both sides by  $dt$

$$0.025y dy = 50(1 + \sin t) dt$$

$$0.025 \frac{y^2}{2} = (50 + 50 \sin t) dt$$

$$\frac{0.025 y^2}{2} = (50 + 50 \sin t) dt$$

$$\frac{0.025 y^2}{2} = 50t - 50 \cos t + c$$

$$0.0125y^2 = 50t - 50 \text{ cost } t$$

$y$  divide through by 0.0125

$$y^2 = 4000t - 4000 \text{ cost } t + 800$$

$$y^2 = 4000(t - \text{cost}) + 800$$

$$y = \sqrt{4000(t - \text{cost}) + 800}$$

```
t =  
Columns 1 through 27  
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  
Columns 28 through 54  
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53  
Columns 55 through 81  
54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80  
Columns 82 through 108  
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107  
Columns 109 through 135  
108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134  
Columns 136 through 162  
135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161  
Columns 163 through 189  
162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188  
Columns 190 through 216
```

Activate Windows  
Go to Settings to activate Windows.



Command Window	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 129 through 144	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 145 through 160	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 161 through 176	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 177 through 192	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 193 through 208	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 209 through 224	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 225 through 240	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Columns 241 through 251	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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```
commandwindow
clear
clc
close all
syms t y yn tn
t= 0:1:500
tn= 0:2:500
y= 50/0.05 +50/1.0025*sin(t) + 50*(0.05)/1.0025*cos(t) - 802.49*exp(-0.05*(t))
yn= 1000 - 800*exp(-0.05*(tn))
plot(t,y,'r', tn,yn,'b')
xlabel('time (min)')
ylabel('v(litre)')
grid on
grid minor
```

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