Jude-shima Favour
17/ENG02/1039
Computer ENGINEERING
ENG 282 Assignment IV

A Let y be the amount of air at time t in (ft^3) in the room.

$\frac{dy}{dt}$ ⇒ Air inflow rate − fress air out flow rate

Fresh air inflow = $100 ft^3/min$

Fresh air out flow = 600

2000 = 0·03 min

The amount flowing out of the room is a function of the amount in the room
$= 0{\cdot}03y\ ft^3/min$

$\frac{dy}{dt} - 600 \cdot 0{\cdot}03y = -0{\cdot}03y + 600$
$= -0{\cdot}03(y - 20{,}000)$

Equation can be resolved as
$\frac{dy}{dt} = -0{\cdot}03(y - 20{,}000)$

$\frac{dy}{y - 20{,}000} = 0{\cdot}03t \therefore \ln(y - 20{,}000) = -0{\cdot}03t + C$
$y - 20{,}000 = e^{-0{\cdot}03t + C}$
$y - 20{,}000 = e^{-0{\cdot}03t} \cdot e^{C}$

At t = 0, y(t) = 0 since no fresh air was contained in the room Initially,
$y = 20{,}000 = (e^{-0{\cdot}03(0)})$
$0 - 20{,}000 = C$
$C = -20{,}000$

Sub C = −20,000
$y - 20{,}000 = e^{-0{\cdot}03t}$
$y = 20000(1 - e^{0{\cdot}03t})$

This is the model for the amount of fresh air in the room

B) Calculate the time at when 90% of the air in the room will be one fresh

$90\% = \frac{90}{100} = 0{\cdot}9$

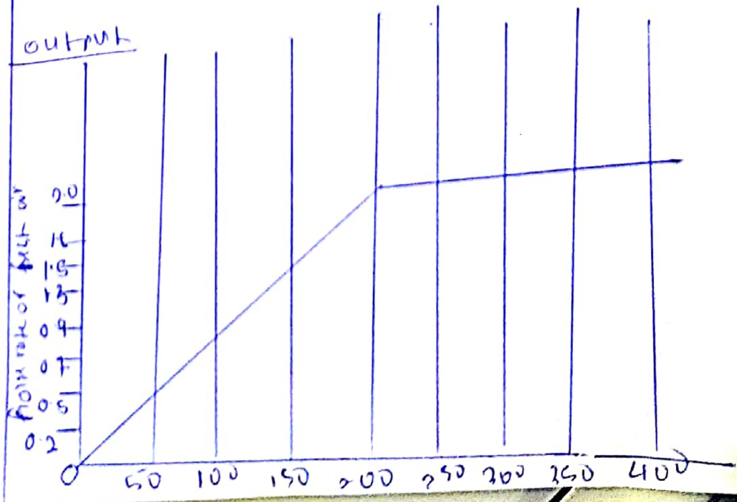
y = 0·9 of 20,000
$18000 ft^3 = 0{\cdot}9 \times 20{,}000$

$\therefore 18000 = 20000(1 - e^{-0{\cdot}03t})$
$18000 = 20000(1 - e^{-0{\cdot}03t})$
$0{\cdot}9 = 1 - e^{-0{\cdot}03t}$
$e^{-0{\cdot}03t} = 1 - 0{\cdot}9 = 0{\cdot}1$

C) Command window

```
% Clear
% clc
% close all
% syms t
% y = 20000 * (1-exp(-0.03*t))
% t = 0; 5 : 360
% yn = subs(y)
% plot (t,yn)
% xlabel (time(min))
% Grid on
% Grid minor
% Axis tight
```

output



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$0.9 = 1 - e^{-0.03t}$

$e^{-0.03t} = 1 - 0.9 = 0.1$

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