Eq can be resolved as

$$\frac{dy}{dt} = -0.03(y - 20{,}000)$$

$$\frac{dy}{y - 20{,}000} = -0.03dt \therefore \ln(y - 20{,}000) = -0.03t + C$$

$$y - 20{,}000 = e^{-0.03t + C}$$

$$y - 20{,}000 = e^{-0.03t} \cdot e^{c}$$ (According to rules of Indices)

At $t = 0$, $y(t) = 0$

Since no fresh air was contained in the room initially

$$y - 20{,}000 = Ce^{-0.03(0)}$$

$$-20{,}000 = C$$

$$C = -20{,}000$$

Sub $C = -20{,}000$

$$y - 20{,}000 = e^{-0.03t} - 20{,}000$$

$$y = 20000(1 - e^{-0.03t})$$

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

(ABUAD), The Road to Intellectualism, Quality and Excellence

Jagun Seyi

17/ENG04/035

Elect/Elect

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

$dy/dt \Rightarrow$ Air inflow rate − fresh air out from rate

Fresh air inflow = 100 ft^3/min

Fresh air outflow = 600

2000 = 0·3 min

The amount flowing out of the room is a function of the amount in the room = $0.03y\ ft^3/min$

$$\frac{dy}{dt} = 600 - 0.03y = -0.03y + 600 = -0.03(y - 20{,}000)$$

Eqn can be resolved as

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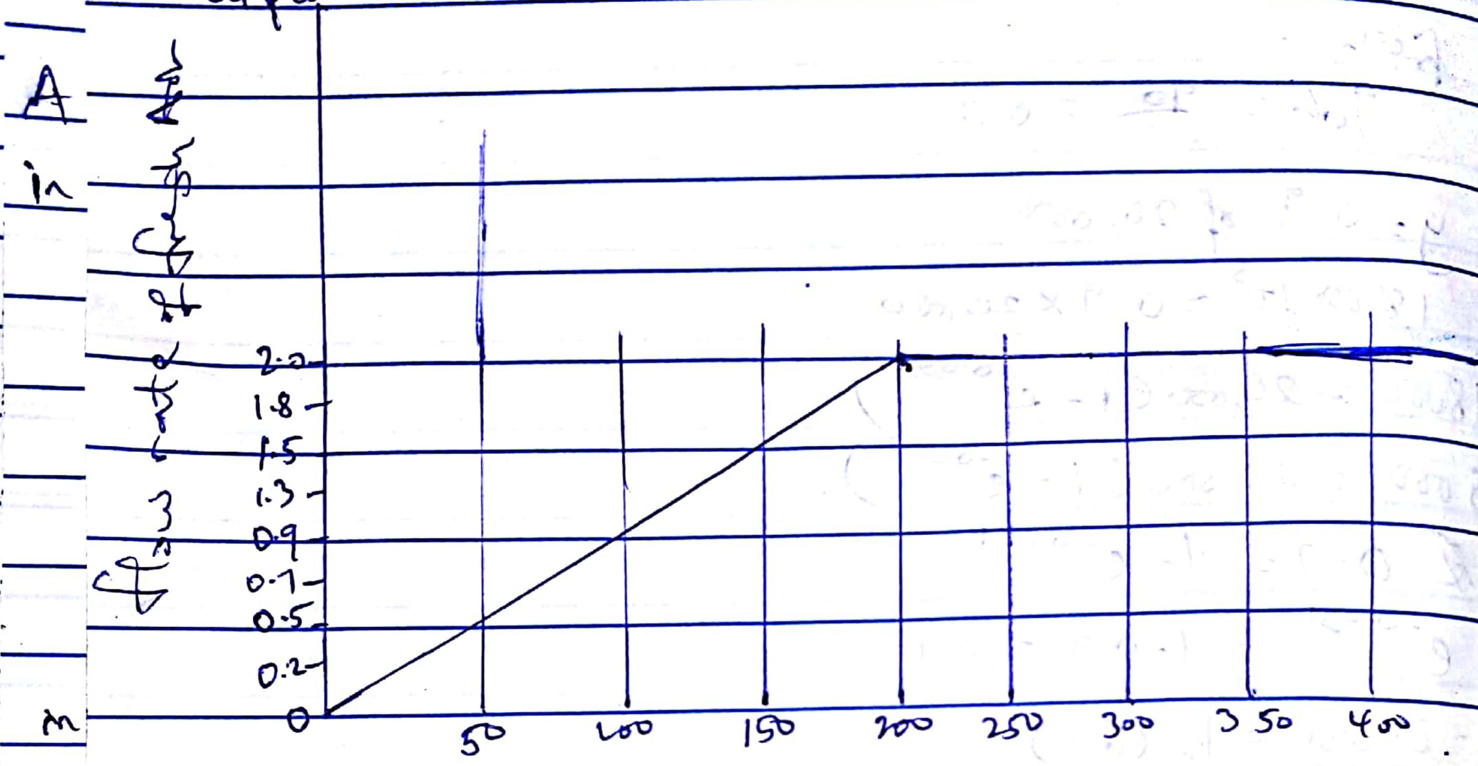
Output



ENG04/035
time, t in (ft³)
out from rate
action of the amount
0.03(y - 20,000)
0.03t + c
s of Indres)
initially
the room

B. Calculate the time at when 90% of the air in the room will become fresh.

$90\% = \frac{90}{100} = 0.9$

$y = 0.9$ of $20,000$

$18000\,ft^3 = 0.9 \times 20,000$

$\therefore 18000 = 20,000(1 - e^{-0.03t})$

$18000 = 20,000(1 - e^{-0.03t})$

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

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

$-0.03t = \ln(0.1)$

$t = 77\,min$.

C) Command window

```
Clear
clc
Close all
Syms t
y = 20,000 * [1 - exp(-0.03*t)]
t = 0:5:360
yn = Subs(y)
Plot (t, yn)
x label [Time (min)]
Grid on
Grid minor
Axis tight
```


e

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