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Mechanics

16/ENG051093

ENG 282

Assignment I

$$y' = ky$$

$$\frac{dy}{dt} = ky$$

$$\int \frac{dy}{y} = \int k dt$$

$$\ln y = kt + c$$

$$y = e^{kt+c} = e^{kt} \times e^c$$

$$\text{let } e^c = y_0$$

$$y = e^{kt} \cdot y_0 \Rightarrow y = y_0 \cdot e^{kt}$$

from the equation

$$y = 2y_0$$

$$\text{i.e. } y_0 \cdot e^{kt} = 2y_0$$

$$\text{at } t = 5 \text{ hr}$$

$$2 = e^{5k}$$

$$\ln 2 = 5k$$

$$k = \frac{\ln 2}{5} = 0.1386$$

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Recall $y_0 = 20$ $k = 0.1386$

$$y = 20 \times e^{0.1386t}$$

b) $1\frac{1}{2} \text{ days} = 36 \text{ hrs}$

$$t = 36 \text{ hrs}$$

$$y = 20 \times e^{0.1386(36)}$$

$$y = 2437.5532$$

c) Solution as seen in the Excel document attached

d) Solution as seen in the excel document attached

e) Increase in time and is directly proportional to the increase in the population of the bacteria i.e. population growth of the bacteria in the growth medium was followed by an increase in time