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16/ENG07/013
PETROLEUM ENG.

(A) The DE of Exponential growth is $y = ky$

$$\frac{dy}{dt} \propto y$$

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

$$\frac{dy}{y} = k\,dt \;;\; \ln y = kt + c$$

$$y = e^{(kt+c)}$$

$$y = e^{kt} \cdot e^{c}, \; (e^{c})$$

$\therefore y = e^{kt}$ is the Solution to the DE

The Experiment Commenced with 20 bacteria

$$y(0) = 20$$

$$20 = e^{kt}$$

$$20 = C$$

$$y = 20e^{kt}$$

Since the doubles every 5hours then, the Model is now

$$40 = 20e^{kt} \equiv e^{5t} = 40/20 = e^{5t} = 2$$

$$\ln(e^{5t}) = \ln 2$$

$$5k \ln 2 \quad \therefore k = \ln 2 / 5 = 0.1386$$

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

(B) Estimating the Population of the Bacteria in 1½ days

1 day = 24 hrs

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

$$y = 2937.55$$

The Number of Bacteria Varies but not Constantly with time for the time different initial number of bacteria

$\therefore$ initial Bacteria = 10 $\therefore$ Final Bacteria = 639.4351

" " = 30 $\therefore$