

181ENG041008

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Course: ENCH 282

Assignment.

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

$$\frac{dy}{y} = kdt$$

$$\int \frac{dy}{y} = \int kdt$$

$$\ln y = kt + c$$

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

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

$$y_0 = e^c$$

$$\therefore y = y_0 e^{kt} \quad \text{for case A}$$

The initial number of bacteria at  $t=0$  is 50

$$\therefore 50 = y_0 e^{k(0)}$$

$$50 = y_0 \cdot 1$$

$$\therefore y_0 = 50$$

$$\therefore y = 50e^{kt}$$

The number of bacteria at  $t=9$  hrs is 500

$$y = 500$$

$$\therefore 500 = 50e^{k(9)}$$

$$10 = e^{9k}$$

$$e^{9k} = \frac{10}{50}$$

$$e^{9k} = \frac{1}{5}$$

$$9k = \ln \frac{1}{5}$$

$$9k = -1.0986$$

$$k = \frac{-1.0986}{9}$$

$$9$$

$$k = -0.122$$

$$\therefore y = 50e^{-0.122(9)}$$

$$\text{i.e. } y_t = 50e^{-0.122(9)}$$

for case A

$$y_{cD} = 50e^{0.1222ct}$$

for case B

$$g = g_0 e^{kt}$$

The initial number at  $t = 0$  is 150

$$\therefore 150 = g_0 e^{k(0)}$$

$$150 = g_0 \cdot 1$$

$$\therefore g_0 = 150$$

$\therefore$  The number of bacteria at  $t = 9$  hrs is

$$\text{is } 150 \times 3 = 450$$

$$\therefore 450 = 150e^{k(9)}$$

$$e^{9k} = \frac{450}{150}$$

$$e^{9k} = 3$$

$$9k = \ln 3$$

$$9k = 1.0986$$

$$k = \frac{1.0986}{9}$$

$$k = 0.122$$

$$\therefore g = 150e^{0.1222ct}$$

$\therefore$  for case B

$$g_{cD} = 150e^{0.1222ct}$$

$t := 0, 1..15$

$y(t) := 50 \cdot e^{0.122(t)}$

$g(t) := 150 \cdot e^{0.122(t)}$

t =

0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

y(t) =

50
56.488
63.817
72.098
81.453
92.022
103.962
117.451
132.691
149.908
169.359
191.334
216.161
244.209
275.896
311.694

g(t) =

150
169.463
191.452
216.293
244.358
276.065
311.885
352.354
398.073
449.725
508.078
574.003
648.483
732.626
827.687
935.083

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