Ahmed Fawwaz Abiola
16/ENG06/004
Mechanical Engineering
ENG 262
Assignment

Solution

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

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

$\int dy/y = \int k\,dt$

$\ln y = kt + C$

$y = e^{kt+C}$

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

$y_0 = e^{C}$

$y = y_0 e^{kt}$ for case A

Initial number of bacteria at $t = 0$

$50 = y_0 e^{k(c)}$

$50 = y_0 \cdot 1$

$\therefore y_0 = 50$

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

Number of bacteria at $t = 9$ hrs is $50 \times 3 = 150$

~~$y = 50e^{k(0)}$~~ $y = 50e^{k(t)}$

$y = 50e^{k(9)}$

$y = 50e^{9k}$

$150 = 50e^{9k}$

$e^{9k} = \frac{150}{50}$

$e^{9k} = 3$

$9k = \ln 3$

$9k = 1.0986$

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

$k = 0.122$

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

$y_t = 50e^{0.122(t)}$

Case A

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

Case B

$g = g_0 e^{kt}$

Initial number at $t=0$ is 150

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

$150 = g_0 1$

$\therefore g_0 = 150$

$150 \times 3 = 450$

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

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

$e^{9k} = 3$

$9k = \ln 3$

$9k = 1.0986$

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

$k = 0.122$

For case B

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

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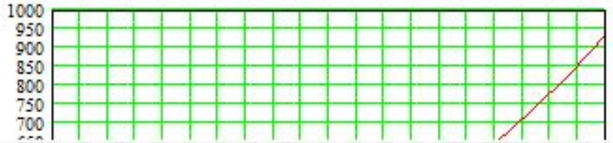
$t := 0, 1 .. 15$

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

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

| t = | y(t) = | g(t) = |
|---|---|---|
| 0 | 50 | 150 |
| 1 | 56.488 | 169.463 |
| 2 | 63.817 | 191.452 |
| 3 | 72.098 | 216.293 |
| 4 | 81.453 | 244.358 |
| 5 | 92.022 | 276.065 |
| 6 | 103.962 | 311.885 |
| 7 | 117.451 | 352.354 |
| 8 | 132.691 | 398.073 |
| 9 | 149.908 | 449.725 |
| 10 | 169.359 | 508.078 |
| 11 | 191.334 | 574.003 |
| 12 | 216.161 | 648.483 |
| 13 | 244.209 | 732.626 |
| 14 | 275.896 | 827.687 |
| 15 | 311.694 | 935.083 |


Calculator

| | | | | |
|---|---|---|---|---|
| n! | i | m..n | $x_n$ | \|x\| |
| ln | $e^x$ | $x^{-1}$ | $x^y$ | $\sqrt[n]{}$ |
| log | π | ( ) | $x^2$ | $\sqrt{}$ |
| tan | 7 | 8 | 9 | / |
| cos | 4 | 5 | 6 | × |
| sin | 1 | 2 | 3 | + |
| := | . | 0 | − | = |

Math

Matrix

Graph

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| | | |
|---|---|---|
| 6 | 103.962 | 352.354 |
| 7 | 117.451 | 398.073 |
| 8 | 132.691 | 449.725 |
| 9 | 149.908 | 508.078 |
| 10 | 169.359 | 574.003 |
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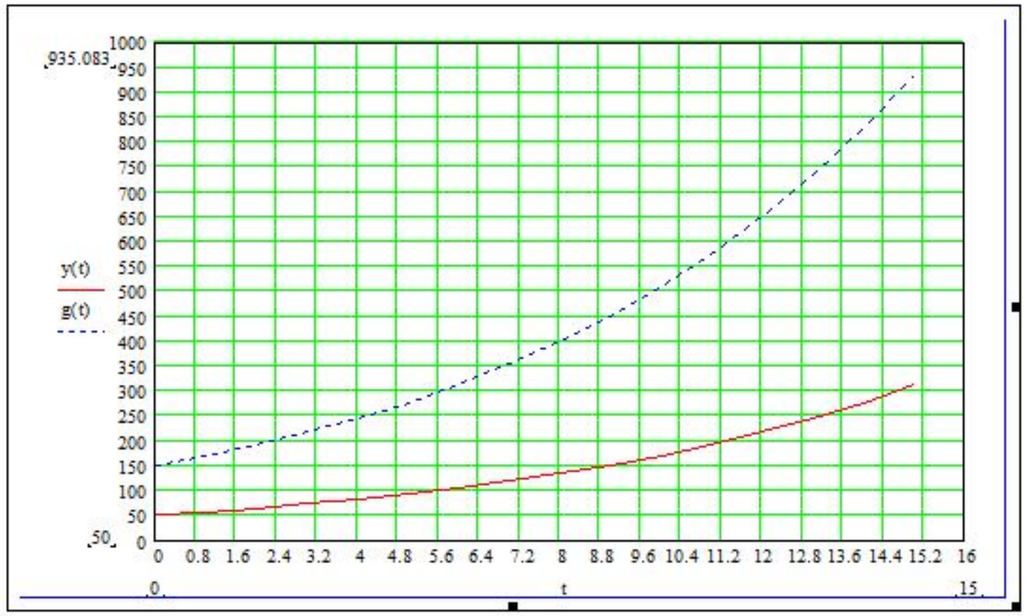


Calculator

n! i m..n $x_n$ |x|
ln $e^x$ $x^{-1}$ $x^y$ $\sqrt[n]{}$
log π ( ) $x^2$ $\sqrt{}$
tan 7 8 9 /
cos 4 5 6 ×
sin 1 2 3 +
:= . 0 − =

Math

Matrix

Graph

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