

Differential Equations

1. $\frac{dA}{dt} = k \ln(A)$

2. $\frac{dp}{dt} = k(N-p)p$

3. $\frac{dP}{dt} = k\sqrt[3]{P}$

4. $\frac{dp}{dt} = k(N-p)$

5. $\frac{dp}{dt} = k(N-p)^2$

6. $\frac{dy}{dt} = ky \Rightarrow y = C_1 e^{kt}$

$y = 1 \cdot e^{k(8)}$
 $2 = 1 \cdot e^{k(8)}$
 $2 = e^{k(8)} \Rightarrow \ln(2) = k(8) \Rightarrow k = \frac{\ln(2)}{8}$

$(0, 1)$
 $(8, 2)$ } suppose these values

7. $\frac{dy}{dt} = ky$ $10\% = k$ $\frac{dy}{dt} = 0.10y$ suppose $(0, 1)$
 $(t, 3)$

$\int \frac{1}{y} dy = \int 0.10 dt \Rightarrow \ln|y| = 0.10t + C \Rightarrow e^{0.10t + C} = |y|$ so

so

$y = 1 \cdot e^{0.10t}$
 $3 = 1 \cdot e^{0.10t}$
 $3 = e^{0.10t}$
 $\ln 3 = 0.10t$
 $\frac{\ln(3)}{0.1} = t$

$\leftarrow y = C e^{0.10t}$

8. $\frac{dy}{dt} = -0.0077y$

$\Rightarrow y = 100 e^{-0.0077t}$

suppose... if $(0, 100)$ when $(t, 50)$
 $50 = 100 e^{-0.0077t}$
 $\frac{1}{2} = e^{-0.0077t}$

$t = \frac{\ln(0.5)}{-0.0077}$

$\ln\left(\frac{1}{2}\right) = -0.0077t$