

Separable Differential Equations

1. (a) Solve the differential equation $\frac{dy}{dt} = y$.

(b) More generally, solve the differential equation $\frac{dy}{dt} = ky$.

2. Solve the following initial value problem:

$$\begin{cases} \frac{dy}{dt} = 2 - \frac{y}{25} \\ y(0) = 0 \end{cases}$$

3. (a) Solve the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2}$.

(b) Find the solution of this equation that satisfies the initial condition $y(0) = 2$.

4. Solve the following differential equation:

$$\frac{dy}{dt} = 0.08y\left(1 - \frac{y}{1000}\right)$$

5. Solve the differential equation $\frac{dy}{dt} = \frac{6x^2}{2y + \cos^2(y)}$.