

Modeling with Differential Equations

Solutions should show all of your work, not just a single final answer.

1. We consider the differential equation $\frac{dy}{dt} = 1 - 2y$.
 - (a) Find all constant solutions.
 - (b) Show every function of the form $y(t) = \frac{1}{2} + Ke^{-2t}$, where K is a constant, is a solution.
 - (c) What can you say about the long-term behavior $\lim_{t \rightarrow \infty} y(t)$ for solutions in part (b)?

2. We consider the differential equation $\frac{dy}{dx} = xy$.
 - (a) Find all constant solutions.
 - (b) Show every function of the form $y(x) = Ke^{x^2/2}$, where K is a constant, is a solution.
 - (c) For a solution as in part (b), describe K as a value of $y(x)$.

3. T/F (with justification)
Every differential equation has a constant solution.