

MATH 441: Differential Equations Exercises

Prepared by Gabriel P. Langlois

Fall 2026

1 Exercises (Introduction and First-Order ODEs)

Exercise 1.1. Find the general solution to the ODE

$$\frac{dy}{dx} = 0.$$

Solution:

Exercise 1.2. Consider the ODE

$$\frac{dy}{dx} = 1.$$

a) Find its general solution.

b) Suppose, in addition, that we require $y(0) = 1$. What is then the solution to the ODE?

Solution:

Exercise 1.3. Find the solution to the ODE

$$\frac{dy}{dx} = y, \quad \text{with } y(0) = 1.$$

Solutions:

Exercise 1.4. Find the general solution to the ODE

$$\frac{d^2y}{dx^2} - 4y = 0, \quad \text{with } y(0) = 1.$$

Exercise 1.5. Find the solution to the ODE

$$\frac{d^2y}{dx^2} + \omega^2 y = 0$$