# Finding Differential Equation Solutions Using Separation of Variables

**Learning Objectives**

- Find a general solution to a differential equation composed of two polynomials using separation of variables
- Find a specific solution to a differential equation composed of two polynomials using separation of variables

*Find a general solution to a differential equation composed of two polynomials using separation of variables*

1. Find the general solution to the differential equation $\frac{dy}{dx} = \frac{x^2+1}{y}$.

*Find a specific solution to a differential equation composed of two polynomials using separation of variables*

2. Find a specific solution to the differential equation $\frac{dy}{dx} = -xy$, $x(0) = 10$.

- $e^{x+C} = e^x e^C$
- When solving for y, even roots can be either positive or negative: only the initial conditions, if known, can determine which sign is needed.

ANSWER KEY

1. $y^2 = \frac{2}{3}x^3 + 2x + C$

2. $y = 10e^{-x^2/2}$