

Problem 1

In each of Problems 1 through 8, solve the given differential equation.

$$y' = x^2/y$$

Solution

This ODE is separable because it is of the form $y' = f(x)g(y)$, so it can be solved by separating variables.

$$\frac{dy}{dx} = \frac{x^2}{y}$$

Bring the terms with y to the left and bring the terms with x to the right.

$$y \, dy = x^2 \, dx$$

Integrate both sides.

$$\int y \, dy = \int x^2 \, dx$$
$$\frac{y^2}{2} = \frac{x^3}{3} + C$$

Now solve for y .

$$y^2 = \frac{2}{3}x^3 + 2C$$
$$y(x) = \pm \sqrt{\frac{2}{3}x^3 + 2C}$$

Therefore, using a new constant C_1 for $2C$,

$$y(x) = \pm \sqrt{\frac{2}{3}x^3 + C_1}.$$