

**Problem Definition**

Problem 5. Find  $dy/dx$ .

$$x^2y^2 - 4y = 1$$

**Solution Step 1:**

The process starts by computing the derivative of both sides of the equation with respect to  $x$ . The differentiated equation is given by

$$\frac{d}{dx}(x^2y^2 - 4y) = \frac{d}{dx}(1)$$

or

$$2xy^2 + x^2\left(2y\frac{dy}{dx}\right) - 4\frac{dy}{dx} = 0$$

The result is an equation that will allow use to solve for  $dy/dx$ .

**Solution Step 2:**

The solution steps result in the following sequence of equations.

$$\begin{aligned}2xy^2 + x^2\frac{dy}{dx} - 4\frac{dy}{dx} &= 0 \\2xy^2 + 2x^2y\frac{dy}{dx} - 4\frac{dy}{dx} &= 0 \\(2x^2y - 4)\frac{dy}{dx} &= -2xy^2 \\ \frac{dy}{dx} &= -\frac{2xy^2}{(2x^2y - 4)}\end{aligned}$$

or finally, we can write

$$\frac{dy}{dx} = -\frac{xy^2}{(x^2y - 2)}$$