

Exercise 6

Find dy/dx by implicit differentiation.

$$2x^2 + xy - y^2 = 2$$

Solution

Differentiate both sides with respect to x .

$$\begin{aligned}\frac{d}{dx}(2) &= \frac{d}{dx}(2x^2 + xy - y^2) \\ 0 &= 2\frac{d}{dx}(x^2) + \frac{d}{dx}(xy) - \frac{d}{dx}(y^2) \\ &= 2(2x) + \left[\frac{d}{dx}(x)\right]y + x\left[\frac{d}{dx}(y)\right] - \left[2y \cdot \frac{d}{dx}(y)\right] \\ &= 4x + (1)y + x(y') - 2y(y') \\ &= 4x + y + xy' - 2yy'\end{aligned}$$

Solve for y' .

$$y' = \frac{4x + y}{2y - x}$$