

# Implicit Differentiation - Answers

① To find the slope, take the derivative implicitly.

$$2y \frac{dy}{dx} + 3(xy+1)^2 \left( x \cdot \frac{dy}{dx} + y(1) \right) = 0. \text{ Now plug in } (2, -1).$$

Ⓓ

$$2(-1)y' + 3(2(-1)+1)^2 (2y' + (-1)) = 0 \Rightarrow -2y' + 3(-1)^2 (2y' - 1) = 0$$

$$-2y' + 3(2y' - 1) = 0, \quad -2y' + 6y' - 3 = 0, \quad 4y' = 3, \quad y' = \frac{dy}{dx} = \frac{3}{4}$$

② take der of  $(1-y^2)^{1/2} = \frac{dy}{dx} \cdot \frac{d^2y}{dx^2} = \frac{1}{2}(1-y^2)^{-1/2} (-2y)y'$

Ⓑ

$$= \frac{-2y(1-y^2)^{1/2}}{2(1-y^2)^{1/2}} = -y$$

③ To find  $\frac{dy}{dx}$ , take der. implicitly. Remember  $\frac{dy}{dx} = y'$

Ⓑ  $y' = xy' + y(1) + 2x$ . Need to find y by putting

$$-1 = x \text{ into } y = xy + x^2 + 1 \text{ so } \begin{aligned} y &= -y + 1 + 1 \\ 2y &= 2 \\ y &= 1 \end{aligned}$$

$$\begin{aligned} x &= -1 \\ y &= 1 \end{aligned}$$

$$y' = (-1)y' + 1 + 2(-1)$$

$$y' = -y' - 1$$

$$2y' = -1$$

$$y' = -\frac{1}{2}$$