

## Quiz 7 - 4/12/2022

Find  $dy/dx$  and simplify:  $x^2y^2 + x \sin(y) = 4y$

### Solution

Differentiate each term with respect to  $x$ .

$$\text{Term 1: } \frac{d}{dx}(x^2y^2) = x^2 \frac{d}{dx}y^2 + y^2 \frac{d}{dx}x^2 = x^2 \cdot 2y \frac{dy}{dx} + y^2 \cdot 2x$$

$$\therefore \frac{d}{dx}(x^2y^2) = 2x^2y \frac{dy}{dx} + 2xy^2$$

$$\text{Term 2: } \frac{d}{dx}[x \sin(y)] = x \frac{d}{dx} \sin(y) + \sin(y) \frac{d}{dx}x = x \cdot \cos(y) \frac{dy}{dx} + \sin(y) \cdot 1$$

$$\text{Term 3: } \frac{d}{dx}(4y) = 4 \frac{dy}{dx}$$

Put everything together and solve for  $dy/dx$ :

$$\begin{aligned} 2x^2y \frac{dy}{dx} + 2xy^2 + x \cos(y) \frac{dy}{dx} + \sin(y) &= 4 \frac{dy}{dx} \\ \Rightarrow 2xy^2 + \sin(y) &= 4 \frac{dy}{dx} - 2x^2y \frac{dy}{dx} - x \cos(y) \frac{dy}{dx} \\ &= \frac{dy}{dx} [4 - 2x^2y - x \cos(y)] \end{aligned}$$

$$\boxed{\therefore \frac{dy}{dx} = \frac{2xy^2 + \sin(y)}{4 - 2x^2y - x \cos(y)}}$$

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**Grading:** Total points possible = 6.

2 pt = correctly differentiate term 1.

2 pt = correctly differentiate term 2.

1 pt = correctly differentiate term 3.

1 pt = correct algebra and final result.