

7. $3xy^2 + 4y = 10$ find y' at $(2, 1)$

use implicit differentiation, $y = y(x)$

$$\begin{aligned}\frac{d}{dx}(3xy^2 + 4y) &= \frac{d}{dx}10 \\&= \frac{d}{dx}(3x) \cdot y^2 + (3x) \cdot \frac{d}{dx}y^2 + \frac{d}{dx}(4y) = 0 \\&= 3y^2 + 3x \cdot 2y \cdot y' + 4y' = 0 \quad (\text{solve for } y')\end{aligned}$$

$$6xy \cdot y' + 4y' = -3y^2$$

$$y'(6xy + 4) = -3y^2$$

$$y' = \frac{-3y^2}{6xy + 4}$$

$$\text{at } (x, y) = (2, 1)$$

$$y' = \frac{-3(1)^2}{6(2)(1) + 4}$$

$$\boxed{y' = -\frac{3}{16}}$$

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