Q1: Assuming that \( y = f(x) \), use implicit differentiation to find \( \frac{dy}{dx} \) at \((x, y) = (1,1)\).

\[
x^2y + 3y^2 = 4
\]

\[
x^2 \frac{dy}{dx} + 2xy + 6y \cdot \frac{dy}{dx} = 0 \quad \Rightarrow \quad (x^2 + 6y) \frac{dy}{dx} = -2xy
\]

\[
\frac{dy}{dx} = -\frac{2xy}{x^2 + 6y}
\]

Substitute \((x, y) = (1,1)\)

\[
(1)^2 \frac{dy}{dx} + 2(1)(1) + 6(1) \cdot \frac{dy}{dx} = 0
\]

\[
\frac{dy}{dx} + 2 + 6 \frac{dy}{dx} = 0 \quad \Rightarrow \quad 7 \frac{dy}{dx} = -2 \quad \text{or} \quad \frac{dy}{dx} = -\frac{2}{7}
\]

Q2: A 10 foot ladder is placed against a vertical wall. Suppose the top slides down the wall at a constant rate of 2 ft/sec. At what rate is the bottom of the ladder sliding away from the wall when the top of the ladder is 8 feet above the floor?

A. Recognizing that this problem is based on a right triangle, assign variable names to the sides of the triangle that are changing and a constant value to the side that is not variable.

\[
\text{Given } \frac{dy}{dt} = -2 \text{ ft/sec}, \text{ find } \frac{dx}{dt} \text{ when } y = 8
\]

B. Complete the statement of the Related Rate problem. Label the known values

\[
\text{Given } \frac{dy}{dt} = -2 \text{ ft/sec}, \text{ find } \frac{dx}{dt} \text{ when } y = 8
\]

C. What equation describes the relationship between the variables that you introduced in part A.

\[
x^2 + y^2 = 10^2
\]
Q1: Assuming that \( y = f(x) \), use implicit differentiation to find \( \frac{dy}{dx} \) at \((x, y) = (1,1)\).

\[ x^2y + 3y^2 = 4 \]

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Given __________________, find __________________ when __________________

C. What equation describes the relationship between the variables that you introduced in part A.