

The background is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance. The text is centered in the middle of the page.

# LESSON 2.3B

DIFFERENTIATION RULES

# FUNDAMENTALS

## Product Rule

$$\frac{d}{dx} (f(x) g(x)) = f(x) g'(x) + f'(x) g(x)$$

## Quotient Rule

$$\frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) = \frac{g(x) f'(x) - f(x) g'(x)}{(g(x))^2}$$

## WARM UP

Find the derivatives:

(a)  $y = (x^3 - 3)(x - 4x^2)$

(b)  $y = \frac{2t + 1}{t - 1}$

If possible, determine  $\frac{dy}{dx}$  or  $\frac{dy}{dt}$  using two different methods. Simplify your answer.

## PROBLEM

For the problems below, explain why you **could** use the Quotient Rule but why it is **not** necessary.

$$(a) \quad y = \frac{x^2 - 5x}{3}$$

$$(b) \quad f(x) = \frac{6}{x^2}$$

$$(c) \quad f(w) = \frac{w^3 - w}{w^2}$$

## **PROBLEM**

Derive a formula for  
finding the derivative of

$$y = f(x)g(x)h(x).$$