

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 2.3A

DIFFERENTIATION RULES

FUNDAMENTALS

1. Constant Rule: $\frac{d}{dx}(c) = 0$

2. Power Rule: $\frac{d}{dx}(x^n) = nx^{n-1}$

3. Constant Multiple Rule: $\frac{d}{dx}(c f(x)) = c f'(x)$

4. Sum/Difference Rule: $\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$

PROBLEM (LEVEL I)

Find the derivatives. Use appropriate notation.

(a) $y = x^5$

(b) $f(x) = \frac{1}{x^3}$

(c) $g(x) = \sqrt{x}$

PROBLEM (LEVEL II)

Find the derivatives. Use appropriate notation.

$$(a) f(x) = \frac{6}{7x^3}$$

$$(b) g(x) = -3x^3 - \sqrt[4]{x} + \frac{x^7}{2}$$

$$(c) h(x) = x^2 - 2x + 1$$

PROBLEM

The equation of motion of a particle is $s = t^3 - 3t$, where s is in meters and t is in seconds. Find

- (a) the velocity and acceleration as functions of t ,
- (b) the acceleration after 2 sec,
- (c) the acceleration when the velocity is 0.

PROBLEM

True or false? Explain why.

(a) $\frac{d}{dx}(e^7) = 7e^6$ where $e = 2.71828\dots$

(b) $\frac{d}{dx}\left(\frac{1}{x^3}\right) = \frac{1}{3x^2}$ (c) $\frac{d}{dx}\left(\frac{x}{\pi}\right) = \frac{1}{\pi}$

(d) If $f'(x) = g'(x)$, then $f(x) = g(x)$.