Section 2.6:   Generalized Power Rule

THE GENERALIZED POWER RULE

For *any* constant exponent n,

$$\frac{d}{dx}\left[(f(x))^n\right] = n(f(x))^{n-1} \cdot f'(x).$$

Example 1.   Find the derivative of $y = (7x^2 - 5x + 2)^3$.

Example 2.   Find the derivative of $y = 18\sqrt{5x^3 - 2x^2 + 3x - 9}$.

Example 3. Find the derivative of $\quad y = \dfrac{4}{\sqrt[5]{4x^3 - 3x^2 + 5x + 7}}.$

Example 4. Find the derivative of $\quad y = \left(\dfrac{1}{x^4 - 3x^3 + 2x - 8} \right)^8.$

Example 5. Find the derivative of $\quad y = \left[\left(x^2 - 3 \right)^4 + 7x^9 \right]^6.$

Supplemental Exercises

Find the derivative f'. Do not simplify.

1. $f(x) = 3(4x^2 - 7)^2$

2. $f(x) = 8(3x - 5)^{3/4}$

3. $f(x) = 7(x^2 + 5x + 1)^4$

4. $f(x) = 6\sqrt{x^2 + 9x + 9}$

5. $f(x) = 8\sqrt[3]{2x + 3}$

ANSWERS

1. $f'(x) = 6(4x^2 - 7)[8x]$

2. $f'(x) = 6(3x - 5)^{-1/4}[3]$

3. $f'(x) = 28(x^2 + 5x + 1)^3[2x + 5]$

4. $f'(x) = 3(x^2 + 9x + 9)^{-1/2}[2x + 9]$

5. $f'(x) = \dfrac{8}{3}(2x + 3)^{-2/3}[2]$