

Differentiation - Power, Constant, and Sum Rules

Differentiate each function with respect to x .

1) $y = 5$

$$y' = 0$$

2) $f(x) = 5x^{18}$

$$f'(x) = 90x^{17}$$

3) $y = 4x^5 + x$

$$y' = 20x^4 + 1$$

4) $f(x) = 4x^4 - 5x - 3$

$$f'(x) = 16x^3 - 5$$

5) $y = 3x^{\frac{5}{4}}$

$$y' = \frac{15}{4}x^{\frac{1}{4}}$$

6) $y = \frac{5}{4}x^{\frac{2}{3}}$

$$y' = \frac{5}{6}x^{-\frac{1}{3}}$$

7) $y = -4x^{-5}$

$$y' = 20x^{-6}$$

8) $y = \frac{3}{x^3} = 3x^{-3}$

$$y' = -9x^{-4}$$

9) $y = x^{\frac{2}{3}}$

$$y' = \frac{2}{3}x^{-\frac{1}{3}}$$

10) $f(x) = -2\sqrt[4]{x} = -2x^{\frac{1}{4}}$

$$f'(x) = -\frac{1}{2}x^{-\frac{3}{4}}$$

$$11) y = \frac{2}{3}x^4 + 5x - x^{-3}$$

$$\frac{dy}{dx} = \frac{8}{3}x^3 + 5 + 3x^{-4}$$

$$12) y = -\frac{1}{2}x^4 + 3x^{\frac{5}{3}} + 2x$$

$$\frac{dy}{dx} = -2x^3 + 5x^{\frac{2}{3}} + 2$$

Differentiate each function with respect to the given variable.

$$13) y = -3r^5 - 5r^2$$

$$\frac{dy}{dr} = -15r^4 - 10r$$

$$14) f(s) = -\frac{3}{s^2} - \frac{4}{s^4} = -3s^{-2} - 4s^{-4}$$

$$\begin{aligned} f'(s) &= 6s^{-3} + 16s^{-5} \\ &= \frac{6}{s^3} + \frac{16}{s^5} \end{aligned}$$

$$15) f(x) = \frac{2}{3}x^{\frac{3}{2}} - \frac{3}{4}x^{\frac{3}{5}}$$

$$f'(x) = x^{\frac{1}{2}} - \frac{9}{20}x^{-\frac{2}{5}}$$

$$16) h(s) = \sqrt{2} \cdot \sqrt[3]{s} + \sqrt{2} \cdot \sqrt[5]{s}$$

$$h(s) = \sqrt{2} \cdot s^{\frac{1}{3}} + \sqrt{2} \cdot s^{\frac{1}{5}}$$

$$h'(s) = \frac{\sqrt{2}}{3} s^{-\frac{2}{3}} + \frac{\sqrt{2}}{5} s^{-\frac{4}{5}}$$

Differentiate each function with respect to x . Problems may contain constants a , b , and c .

$$17) y = 5c$$

$$\frac{dy}{dx} = 0$$

$$18) y = 4ax^{3a} - bx^{3c}$$

$$\frac{dy}{dx} = 12a^2 x^{3a-1} - 3bc x^{3c-1}$$