

Calculus Practice: Differentiating Products and Quotients of Functions 3b**Differentiate each function with respect to x .**

1) $f(x) = \frac{3}{2x^3 + 2}$

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

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

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

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

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

$$7) f(x) = \frac{5x^4 + 2x^3 - x^2}{2x^4 + 5}$$

$$8) y = \frac{2x^5 + 5x^2 + 2}{x^5 + 3}$$

$$9) y = \frac{5x^5 + 3x^3 + 5}{4x^4 + 5}$$

$$10) f(x) = \frac{3x^5 + 4x^3 - 5x^2}{x^2 + 3}$$

Calculus Practice: Differentiating Products and Quotients of Functions 3b

Differentiate each function with respect to x .

1) $f(x) = \frac{3}{2x^3 + 2}$

$$f'(x) = -\frac{3 \cdot 6x^2}{(2x^3 + 2)^2}$$

$$= -\frac{9x^2}{2x^6 + 4x^3 + 2}$$

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

$$\frac{dy}{dx} = -\frac{16x^3}{(4x^4 + 3)^2}$$

$$= -\frac{16x^3}{16x^8 + 24x^4 + 9}$$

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

$$\frac{dy}{dx} = -\frac{4 \cdot 4x}{(2x^2 + 5)^2}$$

$$= -\frac{16x}{4x^4 + 20x^2 + 25}$$

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

$$f'(x) = \frac{(3x^4 - 2) \cdot 2x - (x^2 + 4) \cdot 12x^3}{(3x^4 - 2)^2}$$

$$= \frac{-6x^5 - 48x^3 - 4x}{9x^8 - 12x^4 + 4}$$

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

$$\frac{dy}{dx} = \frac{(2x^2 + 2) \cdot 20x^3 - (5x^4 + 1) \cdot 4x}{(2x^2 + 2)^2}$$

$$= \frac{5x^5 + 10x^3 - x}{x^4 + 2x^2 + 1}$$

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

$$\begin{aligned} \frac{dy}{dx} &= \frac{(2x^3 + 3) \cdot 4x^3 - (x^4 - 2) \cdot 6x^2}{(2x^3 + 3)^2} \\ &= \frac{2x^6 + 12x^3 + 12x^2}{4x^6 + 12x^3 + 9} \end{aligned}$$

$$7) f(x) = \frac{5x^4 + 2x^3 - x^2}{2x^4 + 5}$$

$$\begin{aligned} f'(x) &= \frac{(2x^4 + 5)(20x^3 + 6x^2 - 2x) - (5x^4 + 2x^3 - x^2) \cdot 8x^3}{(2x^4 + 5)^2} \\ &= \frac{-4x^6 + 4x^5 + 100x^3 + 30x^2 - 10x}{4x^8 + 20x^4 + 25} \end{aligned}$$

$$8) y = \frac{2x^5 + 5x^2 + 2}{x^5 + 3}$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{(x^5 + 3)(10x^4 + 10x) - (2x^5 + 5x^2 + 2) \cdot 5x^4}{(x^5 + 3)^2} \\ &= \frac{-15x^6 + 20x^4 + 30x}{x^{10} + 6x^5 + 9} \end{aligned}$$

$$9) y = \frac{5x^5 + 3x^3 + 5}{4x^4 + 5}$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{(4x^4 + 5)(25x^4 + 9x^2) - (5x^5 + 3x^3 + 5) \cdot 16x^3}{(4x^4 + 5)^2} \\ &= \frac{20x^8 - 12x^6 + 125x^4 - 80x^3 + 45x^2}{16x^8 + 40x^4 + 25} \end{aligned}$$

$$10) f(x) = \frac{3x^5 + 4x^3 - 5x^2}{x^2 + 3}$$

$$\begin{aligned} f'(x) &= \frac{(x^2 + 3)(15x^4 + 12x^2 - 10x) - (3x^5 + 4x^3 - 5x^2) \cdot 2x}{(x^2 + 3)^2} \\ &= \frac{9x^6 + 49x^4 + 36x^2 - 30x}{x^4 + 6x^2 + 9} \end{aligned}$$