

**Calculus Practice: Differentiating Products and Quotients of Functions 1b****Differentiate each function with respect to  $x$ .**

1)  $f(x) = (2x^5 + 4) \cdot -5x^4$

2)  $f(x) = (-5x^2 - 4) \cdot 4x^2$

3)  $y = (x^2 - 5)(3x^4 - 4x^2 + 1)$

4)  $f(x) = (3x^4 - 1)(3x^4 - 3)$

5)  $y = (3x^4 + 4)(3x^4 + 1)$

$$6) y = (4x^3 + 5)x^4$$

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

$$8) y = (-x^5 + 4)(x^4 - 4)$$

$$9) f(x) = (3x^3 + 3x^2 + 4)(4x^2 + 4)$$

$$10) y = (4x^2 + 2)(4x^5 + 3x^4 + 1)$$

## Calculus Practice: Differentiating Products and Quotients of Functions 1b

Differentiate each function with respect to  $x$ .

$$1) f(x) = (2x^5 + 4) \cdot -5x^4$$

$$\begin{aligned} f'(x) &= (2x^5 + 4) \cdot -20x^3 - 5x^4 \cdot 10x^4 \\ &= -90x^8 - 80x^3 \end{aligned}$$

$$2) f(x) = (-5x^2 - 4) \cdot 4x^2$$

$$\begin{aligned} f'(x) &= (-5x^2 - 4) \cdot 8x + 4x^2 \cdot -10x \\ &= -80x^3 - 32x \end{aligned}$$

$$3) y = (x^2 - 5)(3x^4 - 4x^2 + 1)$$

$$\begin{aligned} \frac{dy}{dx} &= (x^2 - 5)(12x^3 - 8x) + (3x^4 - 4x^2 + 1) \cdot 2x \\ &= 18x^5 - 76x^3 + 42x \end{aligned}$$

$$4) f(x) = (3x^4 - 1)(3x^4 - 3)$$

$$\begin{aligned} f'(x) &= (3x^4 - 1) \cdot 12x^3 + (3x^4 - 3) \cdot 12x^3 \\ &= 72x^7 - 48x^3 \end{aligned}$$

$$5) y = (3x^4 + 4)(3x^4 + 1)$$

$$\begin{aligned} \frac{dy}{dx} &= (3x^4 + 4) \cdot 12x^3 + (3x^4 + 1) \cdot 12x^3 \\ &= 72x^7 + 60x^3 \end{aligned}$$

$$6) y = (4x^3 + 5)x^4$$

$$\begin{aligned}\frac{dy}{dx} &= (4x^3 + 5) \cdot 4x^3 + x^4 \cdot 12x^2 \\ &= 28x^6 + 20x^3\end{aligned}$$

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

$$\begin{aligned}f'(x) &= (3x^5 - 1) \cdot 3x^2 + (x^3 + 4) \cdot 15x^4 \\ &= 24x^7 + 60x^4 - 3x^2\end{aligned}$$

$$8) y = (-x^5 + 4)(x^4 - 4)$$

$$\begin{aligned}\frac{dy}{dx} &= (-x^5 + 4) \cdot 4x^3 + (x^4 - 4) \cdot -5x^4 \\ &= -9x^8 + 20x^4 + 16x^3\end{aligned}$$

$$9) f(x) = (3x^3 + 3x^2 + 4)(4x^2 + 4)$$

$$\begin{aligned}f'(x) &= (3x^3 + 3x^2 + 4) \cdot 8x + (4x^2 + 4)(9x^2 + 6x) \\ &= 60x^4 + 48x^3 + 36x^2 + 56x\end{aligned}$$

$$10) y = (4x^2 + 2)(4x^5 + 3x^4 + 1)$$

$$\begin{aligned}\frac{dy}{dx} &= (4x^2 + 2)(20x^4 + 12x^3) + (4x^5 + 3x^4 + 1) \cdot 8x \\ &= 112x^6 + 72x^5 + 40x^4 + 24x^3 + 8x\end{aligned}$$