

## Chain + Product Rule Practice

Date \_\_\_\_\_ Period \_\_\_\_\_

**Differentiate each function with respect to  $x$ .**

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

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

3)  $y = (x^5 - 3)(3x^3 - 5)^5$

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

$$5) y = (-3x^5 + 4)\sqrt[5]{3x^3 - 4}$$

$$6) y = (-4x^5 - 3)^{-4}(3x + 2)$$

$$7) y = \sqrt{5x^5 + 4}(-x^2 - 2)$$

$$8) y = (5x^2 + 3)\sqrt[4]{2x^3 - 3}$$

$$9) y = (5x^2 + 4)\sqrt{3x - 1}$$

$$10) y = (-2x^3 - 3)^{-4}(2x^5 + 3)$$

## Answers to Chain + Product Rule Practice (ID: 1)

- 1) 
$$\begin{aligned}\frac{dy}{dx} &= (-3x^2 - 2)^4 \cdot -5 + (-5x + 4) \cdot 4(-3x^2 - 2)^3 \cdot -6x \\ &= (-3x^2 - 2)^3(135x^2 + 10 - 96x)\end{aligned}$$
- 2) 
$$\begin{aligned}\frac{dy}{dx} &= (2x + 3) \cdot 3(-4x^4 + 5)^2 \cdot -16x^3 + (-4x^4 + 5)^3 \cdot 2 \\ &= 2(-4x^4 + 5)^2(-52x^4 - 72x^3 + 5)\end{aligned}$$
- 3) 
$$\begin{aligned}\frac{dy}{dx} &= (x^5 - 3) \cdot 5(3x^3 - 5)^4 \cdot 9x^2 + (3x^3 - 5)^5 \cdot 5x^4 \\ &= 5x^2(3x^3 - 5)^4(12x^5 - 27 - 5x^2)\end{aligned}$$
- 4) 
$$\begin{aligned}\frac{dy}{dx} &= (2x + 1)^3 \cdot -12x^2 + (-4x^3 + 5) \cdot 3(2x + 1)^2 \cdot 2 \\ &= 6(2x + 1)^2(-8x^3 - 2x^2 + 5)\end{aligned}$$
- 5) 
$$\begin{aligned}\frac{dy}{dx} &= (-3x^5 + 4) \cdot \frac{1}{5}(3x^3 - 4)^{-\frac{4}{5}} \cdot 9x^2 + (3x^3 - 4)^{\frac{1}{5}} \cdot -15x^4 \\ &= \frac{12x^2(-21x^5 + 25x^2 + 3)}{5(3x^3 - 4)^{\frac{4}{5}}}\end{aligned}$$
- 6) 
$$\begin{aligned}\frac{dy}{dx} &= (-4x^5 - 3)^{-4} \cdot 3 + (3x + 2) \cdot -4(-4x^5 - 3)^{-5} \cdot -20x^4 \\ &= \frac{228x^5 - 9 + 160x^4}{(-4x^5 - 3)^5}\end{aligned}$$
- 7) 
$$\begin{aligned}\frac{dy}{dx} &= (5x^5 + 4)^{\frac{1}{2}} \cdot -2x + (-x^2 - 2) \cdot \frac{1}{2}(5x^5 + 4)^{-\frac{1}{2}} \cdot 25x^4 \\ &= \frac{x(-45x^5 - 16 - 50x^3)}{2(5x^5 + 4)^{\frac{1}{2}}}\end{aligned}$$
- 8) 
$$\begin{aligned}\frac{dy}{dx} &= (5x^2 + 3) \cdot \frac{1}{4}(2x^3 - 3)^{-\frac{3}{4}} \cdot 6x^2 + (2x^3 - 3)^{\frac{1}{4}} \cdot 10x \\ &= \frac{x(55x^3 - 60 + 9x)}{2(2x^3 - 3)^{\frac{3}{4}}}\end{aligned}$$
- 9) 
$$\begin{aligned}\frac{dy}{dx} &= (5x^2 + 4) \cdot \frac{1}{2}(3x - 1)^{-\frac{1}{2}} \cdot 3 + (3x - 1)^{\frac{1}{2}} \cdot 10x \\ &= \frac{75x^2 - 20x + 12}{2(3x - 1)^{\frac{1}{2}}}\end{aligned}$$
- 10) 
$$\begin{aligned}\frac{dy}{dx} &= (-2x^3 - 3)^{-4} \cdot 10x^4 + (2x^5 + 3) \cdot -4(-2x^3 - 3)^{-5} \cdot -6x^2 \\ &= \frac{2x^2(14x^5 - 15x^2 + 36)}{(-2x^3 - 3)^5}\end{aligned}$$