

Calculus Practice: Chain Rule 2b**Differentiate each function with respect to x .**

1) $y = \sqrt[5]{5x - 2}$

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

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

4) $y = (-3x^3 + 1)^{-3}$

5) $f(x) = (-x^3 + 4)(3x^2 + 1)^{-2}$

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

$$7) f(x) = \sqrt{\frac{4x^5 + 1}{4x^2 + 3}}$$

$$8) f(x) = \frac{4x + 5}{\sqrt{2x^2 + 3}}$$

Calculus Practice: Chain Rule 2b

Differentiate each function with respect to x .

1) $y = \sqrt[5]{5x - 2}$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{5}(5x - 2)^{-\frac{4}{5}} \cdot 5 \\ &= \frac{1}{(5x - 2)^{\frac{4}{5}}}\end{aligned}$$

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

$$\begin{aligned}\frac{dy}{dx} &= -5(-x^5 - 3)^{-6} \cdot -5x^4 \\ &= \frac{25x^4}{(-x^5 - 3)^6}\end{aligned}$$

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

$$\begin{aligned}f'(x) &= -3(4x^3 - 5)^{-4} \cdot 12x^2 \\ &= -\frac{36x^2}{(4x^3 - 5)^4}\end{aligned}$$

4) $y = (-3x^3 + 1)^{-3}$

$$\begin{aligned}\frac{dy}{dx} &= -3(-3x^3 + 1)^{-4} \cdot -9x^2 \\ &= \frac{27x^2}{(-3x^3 + 1)^4}\end{aligned}$$

5) $f(x) = (-x^3 + 4)(3x^2 + 1)^{-2}$

$$\begin{aligned}f'(x) &= (-x^3 + 4) \cdot -2(3x^2 + 1)^{-3} \cdot 6x + (3x^2 + 1)^{-2} \cdot -3x^2 \\ &= \frac{3x(x^3 - 16 - x)}{(3x^2 + 1)^3}\end{aligned}$$

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

$$\begin{aligned} \frac{dy}{dx} &= (5x^2 - 2)^{-3} \cdot 5x^4 + (x^5 + 3) \cdot -3(5x^2 - 2)^{-4} \cdot 10x \\ &= \frac{5x(-x^5 - 2x^3 - 18)}{(5x^2 - 2)^4} \end{aligned}$$

$$7) f(x) = \sqrt{\frac{4x^5 + 1}{4x^2 + 3}}$$

$$\begin{aligned} f'(x) &= \frac{1}{2} \cdot \left(\frac{4x^5 + 1}{4x^2 + 3}\right)^{-\frac{1}{2}} \cdot \frac{(4x^2 + 3) \cdot 20x^4 - (4x^5 + 1) \cdot 8x}{(4x^2 + 3)^2} \\ &= \frac{2x(12x^5 + 15x^3 - 2)}{(4x^5 + 1)^{\frac{1}{2}} \cdot (4x^2 + 3)^{\frac{3}{2}}} \end{aligned}$$

$$8) f(x) = \frac{4x + 5}{\sqrt{2x^2 + 3}}$$

$$\begin{aligned} f'(x) &= \frac{(2x^2 + 3)^{\frac{1}{2}} \cdot 4 - (4x + 5) \cdot \frac{1}{2}(2x^2 + 3)^{-\frac{1}{2}} \cdot 4x}{\left((2x^2 + 3)^{\frac{1}{2}}\right)^2} \\ &= \frac{2(6 - 5x)}{(2x^2 + 3)^{\frac{3}{2}}} \end{aligned}$$