

Calculus Practice: Chain Rule 3b**Differentiate each function with respect to x .**

1) $f(x) = \cos 4x^4$

2) $y = \sin 3x^2$

3) $y = \sin 5x^3$

4) $y = \cos (\sin 4x^3)$

5) $y = \sin (\cos 3x^3)$

6) $f(x) = \sin (\sin x^4)$

$$7) f(x) = \cos 4x^5 \cdot (2x^3 - 1)$$

$$8) y = \cos x^4 \cdot (x^2 + 5)$$

$$9) y = \frac{-5x^5 + 2}{\sin 2x^4}$$

$$10) y = \cos \frac{2x^5}{x^4 + 3}$$

Calculus Practice: Chain Rule 3b

Differentiate each function with respect to x .

1) $f(x) = \cos 4x^4$

$$\begin{aligned} f'(x) &= -\sin 4x^4 \cdot 16x^3 \\ &= -16x^3 \sin 4x^4 \end{aligned}$$

2) $y = \sin 3x^2$

$$\begin{aligned} \frac{dy}{dx} &= \cos 3x^2 \cdot 6x \\ &= 6x \cos 3x^2 \end{aligned}$$

3) $y = \sin 5x^3$

$$\begin{aligned} \frac{dy}{dx} &= \cos 5x^3 \cdot 15x^2 \\ &= 15x^2 \cos 5x^3 \end{aligned}$$

4) $y = \cos(\sin 4x^3)$

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

5) $y = \sin(\cos 3x^3)$

$$\begin{aligned} \frac{dy}{dx} &= \cos(\cos 3x^3) \cdot -\sin 3x^3 \cdot 9x^2 \\ &= -9x^2 \cos(\cos 3x^3) \sin 3x^3 \end{aligned}$$

6) $f(x) = \sin(\sin x^4)$

$$\begin{aligned} f'(x) &= \cos(\sin x^4) \cdot \cos x^4 \cdot 4x^3 \\ &= 4x^3 \cos(\sin x^4) \cos x^4 \end{aligned}$$

$$7) f(x) = \cos 4x^5 \cdot (2x^3 - 1)$$

$$\begin{aligned} f'(x) &= \cos 4x^5 \cdot 6x^2 + (2x^3 - 1) \cdot -\sin 4x^5 \cdot 20x^4 \\ &= 2x^2(3\cos 4x^5 - 20x^5 \sin 4x^5 + 10x^2 \sin 4x^5) \end{aligned}$$

$$8) y = \cos x^4 \cdot (x^2 + 5)$$

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

$$9) y = \frac{-5x^5 + 2}{\sin 2x^4}$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{\sin 2x^4 \cdot -25x^4 - (-5x^5 + 2) \cdot \cos 2x^4 \cdot 8x^3}{\sin^2 2x^4} \\ &= \frac{x^3(-25x \sin 2x^4 + 40x^5 \cos 2x^4 - 16 \cos 2x^4)}{\sin^2 2x^4} \end{aligned}$$

$$10) y = \cos \frac{2x^5}{x^4 + 3}$$

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