

Calculus Practice: Chain Rule 5a

Differentiate each function with respect to x .

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

A) $f'(x) = \frac{1}{x^4} \cdot 4x^3$
 $= \frac{4}{x}$

B) $f'(x) = \frac{1}{4x^3}$

C) $f'(x) = \frac{1}{x^4}$

D) $f'(x) = x^4$

3) $y = e^{\sec 5x^3}$

A) $\frac{dy}{dx} = \sec 5x^3 \tan 5x^3 \cdot 15x^2$

B) $\frac{dy}{dx} = e^{\sec 5x^3}$

C) $\frac{dy}{dx} = e^{\sec 5x^3 - 1} \cdot \sec 5x^3 \tan 5x^3 \cdot 15x^2$

D) $\frac{dy}{dx} = e^{\sec 5x^3} \cdot \sec 5x^3 \tan 5x^3 \cdot 15x^2$

5) $y = e^{3x^4}(x^5 + 3)$

A) $\frac{dy}{dx} = e^{3x^4} \cdot 12x^3 + 5x^4$
 $= x^3(12e^{3x^4} + 5x)$

B) $\frac{dy}{dx} = e^{3x^4} \cdot 12x^3 \cdot 5x^4 + e^{3x^4} \cdot 12x^3 \cdot 5x^4$
 $= 120x^7 e^{3x^4}$

C) $\frac{dy}{dx} = e^{3x^4} \cdot 5x^4 + (x^5 + 3) \cdot e^{3x^4} \cdot 12x^3$
 $= x^3 e^{3x^4} (5x + 12x^5 + 36)$

D) $\frac{dy}{dx} = e^{3x^4} \cdot 5x^4$

2) $y = e^{3x^5}$

A) $\frac{dy}{dx} = e^{3x^5}$

B) $\frac{dy}{dx} = e^{3x^5 - 1} \cdot 15x^4$

C) $\frac{dy}{dx} = e^{3x^5} \cdot 15x^4$

D) $\frac{dy}{dx} = 15x^4$

4) $f(x) = \ln(3x^5 + 5)^5$

A) $f'(x) = (3x^5 + 5)^5$

B) $f'(x) = \frac{1}{(3x^5 + 5)^5} \cdot 5(3x^5 + 5)^4 \cdot 15x^4$
 $= \frac{75x^4}{3x^5 + 5}$

C) $f'(x) = \frac{1}{5(3x^5 + 5)^4 \cdot 15x^4}$
 $= \frac{1}{75x^4(3x^5 + 5)^4}$

D) $f'(x) = \frac{1}{(3x^5 + 5)^5}$

6) $y = (5x^4 - 2) \ln 2x^2$

A) $\frac{dy}{dx} = 20x^3 \cdot \frac{1}{2x^2} \cdot 4x + 20x^3 \cdot \frac{1}{2x^2} \cdot 4x$
 $= 80x^2$

B) $\frac{dy}{dx} = 20x^3 + \frac{1}{2x^2} \cdot 4x$
 $= \frac{2(10x^4 + 1)}{x}$

C) $\frac{dy}{dx} = (5x^4 - 2) \cdot \frac{1}{2x^2} \cdot 4x + \ln 2x^2 \cdot 20x^3$
 $= \frac{2(10x^4 \ln 2x^2 + 5x^4 - 2)}{x}$

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

$$7) y = \frac{4x^5 + 1}{\ln 4x^4}$$

$$\begin{aligned} \text{A) } \frac{dy}{dx} &= \frac{\ln 4x^4 \cdot 20x^4 - (4x^5 + 1) \cdot \frac{1}{4x^4} \cdot 16x^3}{(4x^5 + 1)^2} \\ &= \frac{4(5x^5 \ln 4x^4 - 4x^5 - 1)}{x(4x^5 + 1)^2} \end{aligned}$$

$$\begin{aligned} \text{B) } \frac{dy}{dx} &= \frac{\ln 4x^4 \cdot 20x^4 - (4x^5 + 1) \cdot \frac{1}{4x^4} \cdot 16x^3}{\ln 4x^4} \\ &= \frac{4(5x^5 \ln 4x^4 - 4x^5 - 1)}{x \ln 4x^4} \end{aligned}$$

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