

CALCULUS Derivative Practice

Name Answer Key

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

$$\frac{dy}{dx} = 2x \sin x + x^2 \cos x$$

2) $y = (x^2 + 7)^3$

$$\begin{aligned} \frac{dy}{dx} &= 3(x^2 + 7)^2 \cdot 2x \\ &= 6x(x^2 + 7)^2 \end{aligned}$$

3) $y = \frac{2x^2 - 1}{x^3}$

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

4) $y = \ln(3x^2 - x)$

$$\frac{dy}{dx} = \frac{6x - 1}{3x^2 - x}$$

5) $y = \log x^2$

$$\begin{aligned} \frac{dy}{dx} &= \frac{2x}{x^2 \ln 10} \\ &= \frac{2}{x \ln 10} \end{aligned}$$

6) $y = 8x^3$

$$\frac{dy}{dx} = 24x^2$$

7) $y = 7^x$ $y = e^{x \ln 7}$

$$\frac{dy}{dx} = \ln 7 \cdot 7^x$$

8) $y = 8^{3x^2} = e^{3x^2 \ln 8}$

$$\frac{dy}{dx} = 6x \ln 8 \cdot 8^{3x^2}$$

9) $y = e^{5x}$

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

10) $y = \operatorname{arcsec} x^4$

$$\begin{aligned} \frac{dy}{dx} &= \frac{4x^3}{x^4 \sqrt{x^8 - 1}} \\ &= \frac{4}{x \sqrt{x^8 - 1}} \end{aligned}$$

11) $y = \arcsin 2x^5$

$$\frac{dy}{dx} = \frac{10x^4}{\sqrt{1 - 4x^{10}}}$$

12) $y = \arctan 2x^5$

$$\frac{dy}{dx} = \frac{10x^4}{1 + 4x^{10}}$$

$$13) \frac{d}{dx} \sin 3x^8$$

$$= 24x^7 \cdot \cos 3x^8$$

$$14) \frac{d}{dx} \cos(2^{5x})$$

$$= -5 \ln 2 \cdot 2^{5x} \sin(2^{5x})$$

$$15) \frac{d}{dx} \tan(\sin x)$$

$$= \cos x \cdot \sec^2(\sin x)$$

$$16) \frac{d}{dx} \csc 2x$$

$$= -2 \csc 2x \cdot \cot 2x$$

$$17) \frac{d}{dx} \sec(e^x)$$

$$= e^x \cdot \sec(e^x) \cdot \tan(e^x)$$

$$18) \frac{d}{dx} \cot(\ln x)$$

$$= -\frac{1}{x} \cdot \csc^2(\ln x)$$

$$19) y = x^{\cos x} = e^{\cos x \cdot \ln x}$$

$$\frac{dy}{dx} = \left(-\sin x \cdot \ln x + \frac{\cos x}{x} \right) \cdot x^{\cos x}$$

$$20) y = x^3 \sqrt{2x^5 + 1}$$

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

$$= \frac{6x^2(2x^5 + 1) + 10x^7}{2\sqrt{2x^5 + 1}}$$

$$= \frac{12x^7 + 6x^2 + 10x^7}{2\sqrt{2x^5 + 1}}$$

$$= \frac{22x^7 + 6x^2}{2\sqrt{2x^5 + 1}}$$

$$= \frac{11x^7 + 3x^2}{\sqrt{2x^5 + 1}}$$