

Derivative Skills Test

Period _____

(Power Rule) Differentiate each function with respect to x .

1) $y = x^5 + 3x^3$

2) $f(x) = -2x^5 - 3x^3$

3) $f(x) = 2\sqrt[5]{x}$

4) $y = 4x^{\frac{3}{5}}$

5) $f(x) = x^3$

6) $y = x^5$

(Product/Quotient Rule) Differentiate each function with respect to x .

7) $f(x) = (3x^3 + 3)(3x^5 + 2)$

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

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

$$10) f(x) = \frac{4x^4 - 5x^3}{5x^3 + 3}$$

(Trig/Exponent/Logarithmic and Chain Rules) Differentiate each function with respect to x .

$$11) y = \cos x^3$$

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

$$13) y = e^{5x^3}$$

$$14) f(x) = e^{3x^3}$$

$$15) y = \ln x^3$$

$$16) y = (4x^2 + 1)^3(3x^4 - 4)$$

$$17) y = \log_3 3x^5$$

Derivative Skills Test

Period _____

(Power Rule) Differentiate each function with respect to x .

1) $y = x^5 + 3x^3$

$$\frac{dy}{dx} = 5x^4 + 9x^2$$

2) $f(x) = -2x^5 - 3x^3$

$$f'(x) = -10x^4 - 9x^2$$

3) $f(x) = 2\sqrt[5]{x}$

$$f'(x) = \frac{2}{5x^{\frac{4}{5}}}$$

4) $y = 4x^{\frac{3}{5}}$

$$\frac{dy}{dx} = \frac{12}{5x^{\frac{2}{5}}}$$

5) $f(x) = x^3$

$$f'(x) = 3x^2$$

6) $y = x^5$

$$\frac{dy}{dx} = 5x^4$$

(Product/Quotient Rule) Differentiate each function with respect to x .

7) $f(x) = (3x^3 + 3)(3x^5 + 2)$

$$\begin{aligned} f'(x) &= (3x^3 + 3) \cdot 15x^4 + (3x^5 + 2) \cdot 9x^2 \\ &= 72x^7 + 45x^4 + 18x^2 \end{aligned}$$

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

$$\begin{aligned} f'(x) &= -\frac{4 \cdot 12x^2}{(4x^3 + 5)^2} \\ &= -\frac{48x^2}{16x^6 + 40x^3 + 25} \end{aligned}$$

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

$$\begin{aligned} \frac{dy}{dx} &= (2x^3 + 2) \cdot 10x + (5x^2 + 1) \cdot 6x^2 \\ &= 50x^4 + 6x^2 + 20x \end{aligned}$$

$$10) f(x) = \frac{4x^4 - 5x^3}{5x^3 + 3}$$

$$\begin{aligned} f'(x) &= \frac{(5x^3 + 3)(16x^3 - 15x^2) - (4x^4 - 5x^3) \cdot 15x^2}{(5x^3 + 3)^2} \\ &= \frac{20x^6 + 48x^3 - 45x^2}{25x^6 + 30x^3 + 9} \end{aligned}$$

(Trig/Exponent/Logarithmic and Chain Rules) Differentiate each function with respect to x .

$$11) y = \cos x^3$$

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

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

$$\begin{aligned} \frac{dy}{dx} &= \cos 2x^5 \cdot 10x^4 \\ &= 10x^4 \cos 2x^5 \end{aligned}$$

$$13) y = e^{5x^3}$$

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

$$14) f(x) = e^{3x^3}$$

$$f'(x) = e^{3x^3} \cdot 9x^2$$

$$15) y = \ln x^3$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{x^3} \cdot 3x^2 \\ &= \frac{3}{x} \end{aligned}$$

$$16) y = (4x^2 + 1)^3(3x^4 - 4)$$

$$\begin{aligned} \frac{dy}{dx} &= (4x^2 + 1)^3 \cdot 12x^3 + (3x^4 - 4) \cdot 3(4x^2 + 1)^2 \cdot 8x \\ &= 12x(4x^2 + 1)^2(10x^4 + x^2 - 8) \end{aligned}$$

$$17) y = \log_3 3x^5$$

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{3x^5 \ln 3} \cdot 15x^4 \\ &= \frac{5}{x \ln 3} \end{aligned}$$