

Differentiate each of the following functions.

1.) $f(x) = x^5 \cos x$

9.) $f(x) = \ln x \cdot \sin x$

2.) $f(x) = x^3 \ln x$

10.) $f(x) = \sin 2x$

3.) $f(x) = \sqrt[3]{x^5} \sin x$

11.) $f(x) = x^{10} \ln(x^{10})$

4.) $f(x) = (3x^{10} - 5x^6) \ln x$

12.) $f(x) = \cos x (x^2 - 4x + 1) - (x^3 - 2)$

5.) $f(x) = x \ln x - x$

13.) $f(x) = \frac{\cos x}{x^2}$

6.) $f(x) = \frac{\ln x}{x^3}$

14.) $f(x) = \frac{x^3 - 2x + 1}{x^2}$

7.) $f(x) = \ln(8x^{10})$

15.) $f(x) = \frac{\ln x}{x}$

8.) $f(x) = \sin x \cdot \cos x$

16.) $f(x) = \frac{\ln(x^3)}{\sqrt{x^3}}$

Answers

$$1.) \quad f'(x) = -x^5 \sin x + 5x^4 \cos x \qquad 2.) \quad f'(x) = x^2 + 3x^2 \ln x$$

$$3.) \quad f'(x) = (\cos x) \sqrt[3]{x^5} + \frac{5}{3} \sqrt[3]{x^2} (\sin x) \qquad 4.) \quad f'(x) = (30x^9 - 30x^5) (\ln x) + 3x^9 - 5x^5$$

$$5.) \quad f'(x) = \ln x \qquad 6.) \quad f'(x) = \frac{-3 \ln x + 1}{x^4} \qquad 7.) \quad f'(x) = \frac{10}{x} \qquad 8.) \quad f'(x) = \cos^2 x - \sin^2 x$$

$$9.) \quad f'(x) = \ln x \cos x + \frac{1}{x} \sin x \qquad 10.) \quad f'(x) = 2 (\cos^2 x - \sin^2 x) = 2 \cos 2x$$

$$11.) \quad f'(x) = 10x^9 + 100x^9 \ln x \qquad 12.) \quad f'(x) = -\sin x \cdot (x^2 - 4x + 1) + (\cos x) (2x - 4) - 3x^2$$

$$13.) \quad f'(x) = -\frac{1}{x^2} \sin x - \frac{2}{x^3} \cos x \qquad 14.) \quad f'(x) = 1 + \frac{2}{x^2} - \frac{2}{x^3} \qquad 15.) \quad f'(x) = \frac{1 - \ln x}{x^2}$$

$$16.) \quad f'(x) = \frac{-\frac{9}{2} \ln x + 3}{x^{5/2}}$$