

Practice Problems

Differentiate each of the following functions.

1. $f(x) = \sin(x^3 + 2x - 1)$

2. $f(x) = (3x - 4)^{100}$

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

4. $f(x) = \sin(2x - 1)$

5. $f(x) = \frac{7}{3x^8 - 12x^3}$

6. $f(x) = \sin(15 - x)$

7. $f(x) = -\log_3(x^8 + x^2 - 1)$

8. $f(x) = \cos^6(-7x)$

9. $f(x) = \cos(\cos x)$

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

11. $f(x) = \ln(\sqrt{x^{10} + x^6 + 3})$

12. $f(x) = [\sin(3x) - \cos(5x)]^4$

13. $f(x) = x^2 - x + 6 - \frac{1}{x^2 + 1}$

14. $f(x) = \frac{1}{\sin^3(5x)}$

15. $f(x) = \left(\frac{1}{x} - \frac{1}{x^2}\right)(2x^3 + 4)$

16. $f(x) = (\sin x - \cos x)^2$

17. $f(x) = \cos^4(3 - x)$

18. $f(x) = \log_2(10 - x)$

19. $f(x) = \sin(\ln(\cos x))$

20. $f(x) = (x - 2)^5(4 - x)^7$

Differentiate each of the following and express the derivative in terms of f' . Assume that f is a differentiable function.

21. $h(x) = [f(x)]^{10}$

22. $p(x) = \ln(f(x))$

23. $q(x) = \sqrt[3]{f(x)}$

24. $t(x) = \frac{1}{f(x)}$

25. $m(x) = \sin(f(x))$

26. $w(x) = f(f(x))$

Practice Problems - Answers

1. $f'(x) = (3x^2 + 2) \cos(2x + x^3 - 1)$
2. $f'(x) = 300(3x - 4)^{99}$
3. $f'(x) = -(2x - 4) \sin(x^2 - 4x + 1)$
4. $f'(x) = 2 \cos(2x - 1)$
5. $f'(x) = -\frac{28(2x^5 - 3)}{3x^4(x^5 - 4)^2}$
6. $f'(x) = -\cos(15 - x) = -\cos(x - 15)$
7. $f'(x) = -\frac{8x^7 + 2x}{(x^2 + x^8 - 1) \ln 3}$
8. $f'(x) = -42 \cos^5 7x \sin 7x$
9. $f'(x) = \sin(\cos x) \cdot \sin x$
10. $f'(x) = 2 \cos 2x$
11. $f'(x) = \frac{x^5(5x^4 + 3)}{(x^6 + x^{10} + 3)}$
12. $f'(x) = 4(\sin 3x - \cos 5x)^3(3 \cos 3x + 5 \sin 5x)$
13. $f'(x) = 2x - 1 + \frac{2x}{(x^2 + 1)^2}$
14. $f'(x) = \frac{-15 \cos 5x}{\sin^4 5x}$
15. $f'(x) = 4x - \frac{4}{x^2} + \frac{8}{x^3} - 2$
16. $f'(x) = 2 \sin^2 x - 2 \cos^2 x$ or $-2 \cos 2x$
17. $f'(x) = 4 \cos^3(3 - x) \sin(3 - x) = -4 \cos^3(x - 3) \sin(x - 3)$
18. $f'(x) = \frac{1}{(x - 10) \ln 2}$
19. $f'(x) = -\frac{\sin x \cdot \cos(\ln(\cos x))}{\cos x}$
20. $f'(x) = 5(x - 2)^4(4 - x)^7 - 7(x - 2)^5(4 - x)^6 = -2(6x - 17)(x - 2)^4(x - 4)^6$
21. $h'(x) = 10(f(x))^9 f'(x)$
22. $p'(x) = \frac{f'(x)}{f(x)}$
23. $q'(x) = \frac{f'(x)}{3\sqrt[3]{(f(x))^2}}$
24. $t'(x) = -\frac{f'(x)}{(f(x))^2}$
25. $m'(x) = f'(x) \cos(f(x))$
26. $w'(x) = f'(f(x)) \cdot f'(x)$

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