

Practice Problems

Differentiate each of the following functions. Assume that a, b , and c are constants.

1. $f(x) = 3x^2 - 5x + 8$
2. $f(x) = ax^2 + bx + c$
3. $f(x) = \frac{1}{x^3}$
4. $f(x) = \sqrt[5]{x^2}$
5. $f(x) = -(x+1)^2$
6. $f(x) = x^2 - \frac{1}{x^2}$
7. $f(x) = -\frac{2}{3}(x^7 + 2x - 15)$
8. $f(x) = \sqrt{x^7} - \frac{1}{x^7} - e^7$
9. $f(x) = \frac{(x+5)^3 + (x-5)^3}{2}$
10. $f(x) = 3\pi^5 - 3\pi + 5$
11. $f(x) = \frac{(x+5)^3 - (x-5)^3}{2}$
12. $f(x) = \sqrt[7]{x^3} + \sqrt[3]{x^7}$
13. $f(x) = x^{10} + \sqrt[10]{x} + \frac{1}{\sqrt[10]{x}} + \frac{1}{x^{10}}$
14. $f(x) = 3x^8 - 4x^5 + x^2 - 6$
15. $f(x) = -\frac{1}{x^2}(2x^3 + 4)$
16. $f(x) = x^a + \sqrt[b]{x}$
17. $f(x) = x + 1 - \frac{1}{x}$
18. $f(x) = 5x^4 - \pi^2 + 3x - \frac{1}{e}$
19. $f(x) = \frac{3}{x} - x + (x - e)^2$
20. $f(x) = \pi x^2 - e^3 - \frac{5x}{\sqrt[3]{x^2}}$
21. Find a function $f(x)$ so that
 - a) $f'(x) = 6x$
 - b) $f'(x) = x^2 + x$
 - c) $f'(x) = \frac{1}{x^5}$

Practice Problems - Answers

1. $f'(x) = 6x - 5$

2. $f'(x) = 2ax + b$

3. $f'(x) = -\frac{3}{x^4}$

4. $f'(x) = \frac{2}{5}x^{-3/5} = \frac{2}{5\sqrt[5]{x^3}} = \frac{2}{5x}\sqrt[5]{x^2}$

5. $f'(x) = -2x - 2$

6. $f'(x) = 2x + \frac{2}{x^3}$

7. $f'(x) = -\frac{14}{3}x^6 - \frac{4}{3}$

8. $f'(x) = \frac{7}{2}x^{5/2} + 7x^{-8}$

9. $f'(x) = 3x^2 + 75$

10. $f'(x) = 0$

11. $f'(x) = 30x$

12. $f'(x) = \frac{3}{7}x^{-4/7} + \frac{7}{3}x^{4/3}$

13. $f'(x) = 10x^9 + \frac{1}{10\sqrt[10]{x^9}} - \frac{1}{10x\sqrt[10]{x}} - \frac{10}{x^{11}}$

14. $f'(x) = 24x^7 - 20x^4 + 2x$

15. $f'(x) = -2 + \frac{8}{x^3}$

16. $f'(x) = ax^{a-1} + \frac{1}{b}\frac{\sqrt[b]{x}}{x}$

17. $f'(x) = 1 + \frac{1}{x^2}$

18. $f'(x) = 20x^3 + 3$

19. $f'(x) = 2x - 2e - 1 - \frac{3}{x^2}$

20. $f'(x) = 2\pi x - \frac{5}{3\sqrt[3]{x^2}}$

21.) a) $f(x) = 3x^2$ b) $f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2$ c) $f(x) = -\frac{1}{4x^4}$