

4.3 Exercises

1. Find the derivative of each of the following functions two ways: (i) using the Product Rule and (ii) by multiplying out and then differentiating.

a) $f(x) = x^2(x^3 - 1)$

b) $f(x) = (x+3)^2$

c) $f(x) = (4x+1)(3x-2)$

d) $f(x) = (x^2+2)(x^2-2)$

2. Suppose functions f and g are defined so that $f(1) = 5$, $f'(1) = 10$ and $g(1) = 4$, $g'(1) = 3$.

a) If $h(x) = f(x) \cdot g(x)$, find $h'(1)$.

b) If $k(x) = \frac{f(x)}{g(x)}$, find $k'(1)$.

In Exercises 3–24, find a rule for the derivative of the given function.

3. $f(x) = x \sin x$

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

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

6. $f(x) = e^x \cos x$

7. $f(x) = xe^x$

8. $s = (t^2 + 1)e^t$

9. $f(x) = -4x + 2 \tan x$

10. $y = \sin x \cdot \cos x$

11. $y = \frac{2x}{x+1}$

12. $f(x) = \frac{x+1}{x-1}$

13. $s(t) = \frac{2t+3}{2t-2}$

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

15. $y = \frac{\sin x}{x+1}$

16. $f(x) = \frac{1}{1+\sqrt{x}}$

17. $f(x) = \frac{x}{\sin x}$

18. $y = \frac{\tan x}{e^x}$

19. $y = \frac{1 - \sin x}{1 + \sin x}$

20. $f(x) = \frac{\sin x}{1 + \cos x}$

21. $y = \frac{x^2+1}{1-x}$

22. $y = \frac{x \sin x}{1 + \cos x}$

23. $y = \frac{2^x}{3^x}$

24. $y = x \cdot 5^x$

4.3 Exercises (pp. 215-217)

1. a) $5x^4 - 2x$ b) $2x + 6$ c) $24x - 5$ d) $4x^3$ 3. $x \cos x + \sin x$ 5. $(x^2 + 1) \cos x + 2x \sin x$

7. $e^x(x+1)$ 9. $-4 + 2 \sec^2 x$ 11. $\frac{2}{(x+1)^2}$ 13. $\frac{-5}{2(t-1)^2}$ 15. $\frac{(x+1) \cos x - \sin x}{(x+1)^2}$

17. $\frac{\sin x - x \cos x}{\sin^2 x}$ 19. $\frac{-2 \cos x}{(1 + \sin x)^2}$ 21. $\frac{-x^2 + 2x + 1}{(1-x)^2}$ 23. $\frac{2^x (\ln 2 - \ln 3)}{3^x} = \left(\frac{2}{3}\right)^x \ln\left(\frac{2}{3}\right)$

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b) 25/10