

Derivative Practice: All Rules

Find the indicated derivative in each case. You should try to simplify your answers if you can, including factoring when possible.

1. $f'(t)$ for $f(t) = \frac{t^2}{\sqrt{t+1}}$

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

3. $\frac{dz}{dx}$ for $z = (x+1)^3(5-x)^4$

4. $f'(\theta)$ for $f(\theta) = \frac{1}{\tan(2\theta)}$

5. $f''(x)$ for $f(x) = 3x \cdot 2^{5x}$

6. $f'(\beta)$ for $f(\beta) = \frac{\beta y + y^6}{1 - \beta}$

7. $\frac{dy}{dt}$ for $y = \ln(\ln(2t^3))$

8. $g'(x)$ for $g(x) = x \cdot e^{x^2}$

9. $x'(r)$ for $x(r) = 3\sqrt[3]{r} - \sqrt{\frac{3}{r}} + \frac{1}{3r}$

10. $h'(y)$ for $h(y) = \frac{\cos y}{1 - \sin y}$

11. $\frac{dz}{dx}$ for $z = 10^{2 \log x}$

12. $f'(x)$ for $f(x) = \arcsin(4x^2 + 1)$

13. $f'(t)$ for $f(t) = \arctan\left(\frac{2}{t}\right)$

14. $g'(\theta)$ for $g(\theta) = \sqrt{3\theta + \tan^2(4\theta)}$

15. $f'(x)$ for $f(x) = x \cos(e^x)$

16. $\frac{d^2y}{du^2}$ for $x^2 - y^2 = 25$

17. $g'(z)$ for $g(z) = (\sin z)^{2z+1}$

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

19. $a'(t)$ for $a(t) = \ln\left(\frac{1 - \cos t}{1 + \cos t}\right)^4$

20. $(g^{-1})'(2)$ if $g(x) = 2x^3 - x^2 + 1$

21. $\frac{dy}{dx}$ for $x^2 + 2xy + \sin(y^2) = 3$

22. $f'(m)$ for $f(m) = (\sec m)^{\sqrt{m}}$

23. $g'(\theta)$ for $g(\theta) = \sqrt[3]{\tan(5\theta)}$

24. $\frac{dy}{du}$ for $y = (\cot 1 + \cot u)^\pi$

25. $\frac{dy}{dt}$ for $y = \frac{x^3 \sin^3 x}{(x+1)^2 \sqrt[3]{(3x^3+x)^2}}$

26. $(q^{-1})'(1)$ for $q(t) = 3t + \arccos t$