

ANSWERS TO DERIVATIVE RULES WORKSHEET

1. $h'(y) = \frac{1}{y(1 - \ln y)^2}$ Use quotient rule, then simplify.

2. $f'(x) = -x^{-2} - 3x^{-4}$ Rewrite as $f(x) = x^{-1} + x^{-3}$ first.

3. $f'(z) = \frac{b}{1-b}$ Notice that the function is just linear in z .

4. $\frac{dy}{dx} = e^{4x}(x+1)^2(4x+7)$ Use product rule, then simplify.

5. $f'(m) = -2\sin(2m)$ Rewrite as $f(m) = \cos(2m)$ first.

6. $x'(r) = \frac{3}{2}r^{-1/2} + \frac{\sqrt{3}}{2}r^{-3/2} - \frac{1}{6}r^{-3/2}$ Rewrite as $x(r) = 3r^{1/2} - \sqrt{3}r^{-1/2} + \frac{1}{3}r^{-1/2}$ first.

7. $y'(p) = \frac{2p}{3(5+p^2)}$ Rewrite as $y(p) = \frac{1}{3}\ln(5+p^2)$ first.

8. $\frac{dy}{dx} = \frac{-2xy - 2(x+y)}{x^2 + 2(x+y)}$ Use implicit differentiation.

9. $f'(t) = \frac{2}{\sqrt{1-4t^2}}$ Use chain rule.

10. $g'(\theta) = \frac{5}{3}\sec^2(5\theta)(\tan(5\theta))^{-2/3}$ Use chain rule.

11. $\frac{dy}{du} = \ln 3 \cdot 3^u - 3\cot^2 u \cdot \csc^2 u$ Use chain rule for part of the function.

12. $f'(x) = \frac{4ax + ax^2}{(2-x)^4}$ Use quotient rule, then simplify by canceling a common factor.

13. $h'(y) = \frac{1}{1 - \sin y}$ Use quotient rule, then simplify using a trig identity.

14. $f'(t) = \frac{2-t^3}{2(t^3+1)^{3/2}}$ Use quotient rule, then simplify.

$$15. g'(x) = \begin{cases} \frac{2-x^2}{(x^2+2)^2} & x > 0 \\ e^x(x+1) & x < 0 \end{cases} \quad \text{Differentiate each part, then decide if } x=0 \text{ can be included.}$$

$$16. p'(x) = \frac{1}{d}(2ax+b) \quad \text{Notice that } x \text{ is the only variable.}$$

$$17. \frac{d^2y}{d\theta^2} = 0 \quad \text{Use a trig identity first.}$$

$$18. \text{ A. } h'(x) = f'(x^2) \cdot 2x \quad h'(2) = -10$$

$$\text{ B. } k'(x) = 2f(x) \cdot f'(x) \quad k'(4) = -25$$

$$\text{ C. } g'(x) = \frac{1}{f'(f^{-1}(x))} \quad g'(5) = -\frac{2}{5}$$

$$\text{ D. } p'(x) = \frac{f'(x)}{f(x)} \quad p'(x) = -\frac{1}{2}$$

19. A. The number of motor vehicles (in millions) that were registered in 2000.

B. The number of years after 1980 when there were 400 million motor vehicles registered in the world.

C. Approximate: The additional number of motor vehicles (in millions) that were registered between 2000 and 2001.

D. Approximate: The time (in years) for the number of registered motor vehicles to increase from 400 million to 401 million.