

All problems on this review are to be worked without a calculator.

For problems 1-6, find $\frac{dy}{dx}$

1. $x^3 + y^3 = 8xy$

2. $x^3 - xy + y^2 = 4$

3. $x^2y + y^2x = -2$

4. $2\sin x \cos y = 1$

5. $\sin x + 2\cos(2y) = 1$

6. $y = \sin(xy)$

7. Find $\frac{d^2y}{dx^2}$ for $x^2 - y^2 = 16$

8. Find an equation of the tangent line to the curve $x^3 + y^3 = 2xy$ at the point $(1,1)$.

For problems 9-10, find $\frac{d}{dx}(f^{-1}(x))$ at $x = a$

9. $f(x) = \frac{1}{4}x^3 + x - 1$ where $a = 3$

10. $f(x) = \sqrt{x-4}$ where $a = 2$

Use the table to find each derivative.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
-1	$\frac{1}{2}$	6	-3	0
1	-1	4	5	-2

11. $\frac{d}{dx}[3f(x) + 2g(x)]_{x=-1}$

12. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]_{x=1}$

13. $\frac{d}{dx}[f(x)g(x)]_{x=-1}$

14. $\frac{d}{dx}[g(f(x))]_{x=1}$

Find the derivative of each. Simplify appropriately.

15. $y = x^2 \sin x$

16. $y = \sec x \tan x$

17. $y = x^3 \sin x - 5 \cos x$

18. $y = 5^x e^x$

19. $y = \frac{\sec x}{x}$

20. $y = \csc(5 - 2x)$

21. $y = (3x^2 - 5x)^3$

22. $y = \cos^2(3x - 7)$

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

24. $y = 7^{\ln x}$

25. $y = \ln \sqrt{x}$

26. $y = \log_4(\cot x)$

27. $y = \log_3 x^2$

28. $y = x^{\sqrt{x}}$

29. $y = x^{\frac{1}{x}}$

30. $y = \sin^{-1}(x^3)$

31. $y = \tan^{-1} \sqrt{x}$

32. $y = \cos^{-1} \frac{1}{x}$

Answers:

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|------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------|
| 1) $\frac{dy}{dx} = \frac{8y - 3x^2}{3y^2 - 8x}$ | 2) $\frac{dy}{dx} = \frac{y - 3x^2}{2y - x}$ | 3) $\frac{dy}{dx} = \frac{-2xy - y^2}{x^2 + 2xy}$ | 4) $\frac{dy}{dx} = \frac{-2\cos x \cos y}{-2\sin x \sin y} = \cot x \cot y$ |
| 5) $\frac{dy}{dx} = \frac{\cos x}{4\sin(2y)}$ | 6) $\frac{dy}{dx} = \frac{y \cos(xy)}{1 - x \cos(xy)}$ | 7) $\frac{d^2y}{dx^2} = \frac{-16}{y^3}$ | 8) $y - 1 = -1(x - 1)$ |
| 9) $\frac{1}{4}$ | 10) 4 | 11) -9 | 12) $\frac{9}{8}$ |
| 13) -18 | 14) 0 | 15) $x[x \cos x + 2 \sin x]$ | 16) $\sec x(\sec^2 x + \tan^2 x)$ |
| 17) $x^3 \cos x + 3x^2 \sin x + 5 \sin x$ | 18) $5^x e^x [1 + \ln 5]$ | 19) $\frac{\sec x(x \tan x - 1)}{x^2}$ | 20) $2 \csc(5 - 2x) \cot(5 - 2x)$ |
| 21) $3(6x - 5)(3x^2 - 5x)^2$ | 22) $-6 \cos(3x - 7) \sin(3x - 7)$ | 23) $\frac{-1}{(2x + 1)^3}$ | 24) $\frac{7^{\ln x} \ln 7}{x}$ |
| 25) $\frac{1}{2x}$ | 26) $\frac{-\csc^2 x}{\cot x \ln 4}$ | 27) $\frac{2}{x \ln 3}$ | 28) $x^{\sqrt{x}} \left[\frac{2 + \ln x}{2\sqrt{x}} \right]$ |
| 29) $x^{\frac{1}{x}} \left[\frac{1 - \ln x}{x^2} \right]$ | 30) $\frac{3x^2}{\sqrt{1 - x^6}}$ | 31) $\frac{1}{2\sqrt{x}[x + 1]}$ | 32) $\frac{1}{x^2 \sqrt{1 - \frac{1}{x^2}}} = \frac{1}{x\sqrt{x^2 - 1}}$ |