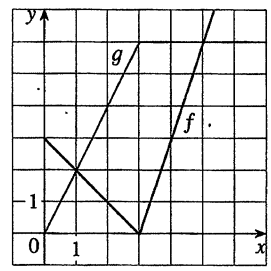


1-30 ■ Calculate y' .

1. $y = (x^4 - 3x^2 + 5)^3$
2. $y = \cos(\tan x)$
3. $y = \sqrt{x} + \frac{1}{\sqrt[3]{x^4}}$
4. $y = \frac{3x - 2}{\sqrt{2x + 1}}$
5. $y = 2x\sqrt{x^2 + 1}$
6. $y = \frac{e^x}{1 + x^2}$
7. $y = e^{\sin 2\theta}$
8. $y = e^{-t}(t^2 - 2t + 2)$
9. $y = \frac{t}{1 - t^2}$
10. $y = \sin^{-1}(e^x)$
11. $y = xe^{-1/x}$
12. $y = x^t e^{xt}$
13. $xy^4 + x^2y = x + 3y$
14. $y = \ln(\csc 5x)$
15. $y = \frac{\sec 2\theta}{1 + \tan 2\theta}$
16. $x^2 \cos y + \sin 2y = xy$
17. $y = e^{cx}(c \sin x - \cos x)$
18. $y = \ln(x^2 e^x)$
19. $y = \log_5(1 + 2x)$
20. $y = (\ln x)^{\cos x}$
21. $y = \ln \sin x - \frac{1}{2} \sin^2 x$
22. $y = \frac{(x^2 + 1)^4}{(2x + 1)^3(3x - 1)^5}$
23. $y = x \tan^{-1}(4x)$
24. $y = e^{\cos x} + \cos(e^x)$
25. $y = \ln |\sec 5x + \tan 5x|$
26. $y = 10^{\tan \pi\theta}$
27. $y = \cot(3x^2 + 5)$
28. $y = \ln \left| \frac{x^2 - 4}{2x + 5} \right|$
29. $y = \sin(\tan \sqrt{1 + x^3})$
30. $y = \arctan(\arcsin \sqrt{x})$

31. If $f(x) = 1/(2x - 1)^5$, find $f''(0)$.
32. Find y'' if $x^6 + y^6 = 1$.
33. If $f(x) = 2^x$, find $f^{(n)}(x)$.
34. Find an equation of the tangent to the curve $\sqrt{x} + \sqrt{y} = 3$ at the point $(4, 1)$.
35. (a) If $f(x) = x\sqrt{5 - x}$, find $f'(x)$.
 (b) Find equations of the tangent lines to the curve $y = x\sqrt{5 - x}$ at the points $(1, 2)$ and $(4, 4)$.
 (c) Illustrate part (b) by graphing the curve and tangent lines on the same screen.
 (d) Check to see that your answer to part (a) is reasonable by comparing the graphs of f and f' .
36. (a) If $f(x) = 4x - \tan x$, $-\pi/2 < x < \pi/2$, find f' and f'' .
 (b) Check to see that your answers to part (a) are reasonable by comparing the graphs of f , f' , and f'' .
37. If $f(x) = xe^{\sin x}$, find $f'(x)$. Graph f and f' on the same screen and comment.

38. (a) Graph the function $f(x) = x - 2 \sin x$ in the viewing rectangle $[0, 8]$ by $[-2, 8]$.
 (b) On which interval is the average rate of change larger: $[1, 2]$ or $[2, 3]$?
 (c) At which value of x is the instantaneous rate of change larger: $x = 2$ or $x = 5$?
 (d) Check your visual estimates in part (c) by computing $f'(x)$ and comparing the numerical values of $f'(2)$ and $f'(5)$.
39. Suppose that $h(x) = f(x)g(x)$ and $F(x) \neq f(g(x))$, where $f(2) = 3$, $g(2) = 5$, $g'(2) = 4$, $f'(2) = -2$, and $f'(5) = 11$. Find (a) $h'(2)$ and (b) $F'(2)$.
40. If f and g are the functions whose graphs are shown, let $P(x) = f(x)g(x)$, $Q(x) = f(x)/g(x)$, and $C(x) = f(g(x))$. Find (a) $P'(2)$, (b) $Q'(2)$, and (c) $C'(2)$.



- 41-48 ■ Find f' in terms of g' .
41. $f(x) = x^2g(x)$
 42. $f(x) = g(x^2)$
 43. $f(x) = [g(x)]^2$
 44. $f(x) = g(g(x))$
 45. $f(x) = g(e^x)$
 46. $f(x) = e^{g(x)}$
 47. $f(x) = \ln |g(x)|$
 48. $f(x) = g(\ln x)$
- 49-50 ■ Find h' in terms of f' and g' .
49. $h(x) = \frac{f(x)g(x)}{f(x) + g(x)}$
 50. $h(x) = f(g(\sin 4x))$
51. At what point on the curve $y = [\ln(x + 4)]^2$ is the tangent horizontal?
 52. (a) Find an equation of the tangent to the curve $y = e^x$ that is parallel to the line $x - 4y = 1$.
 (b) Find an equation of the tangent to the curve $y = e^x$ that passes through the origin.
 53. Find the points on the ellipse $x^2 + 2y^2 = 1$ where the tangent line has slope 1.
 54. (a) On what interval is the function $f(x) = (\ln x)/x$ increasing?
 (b) On what interval is f concave upward?

55. An equation of motion of the form $s = Ae^{-\alpha t} \cos(\omega t + \delta)$ represents damped oscillation of an object. Find the velocity and acceleration of the object.
56. A particle moves on a vertical line so that its coordinate at time t is $y = t^3 - 12t + 3$, $t \geq 0$.
 (a) Find the velocity and acceleration functions.
 (b) When is the particle moving upward and when is it moving downward?
 (c) Find the distance that the particle travels in the time interval $0 \leq t \leq 3$.
 (d) Graph the position, velocity, and acceleration functions for $0 \leq t \leq 3$.
 (e) When is the particle speeding up? When is it slowing down?
57. The mass of part of a wire is $x(1 + \sqrt{x})$ kilograms, where x is measured in meters from one end of the wire. Find the linear density of the wire when $x = 4$ m.
58. The volume of a right circular cone is $V = \pi r^2 h/3$, where r is the radius of the base and h is the height.
 (a) Find the rate of change of the volume with respect to the height if the radius is constant.
 (b) Find the rate of change of the volume with respect to the radius if the height is constant.
59. The cost, in dollars, of producing x units of a certain commodity is

$$C(x) = 920 + 2x - 0.02x^2 + 0.00007x^3$$
 (a) Find the marginal cost function.
 (b) Find $C'(100)$ and explain its meaning.
 (c) Compare $C'(100)$ with the cost of producing the 101st item.
 (d) For what value of x does C have an inflection point? What is the significance of this value of x ?

CHAPTER THREE REVIEW