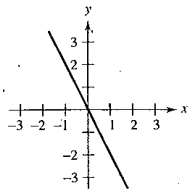
EXERCISES FOR SECTION 3.6

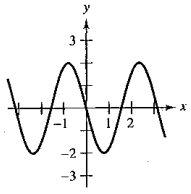
In Exercises 1–4, match the graph of f in the left column with that of its derivative in the right column.

Graph of f | *Graph of f'*

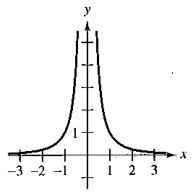
1.



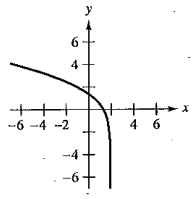
(a)



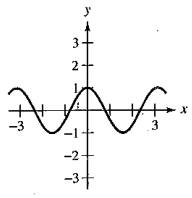
2.



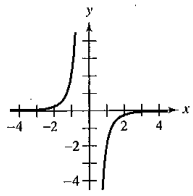
(b)



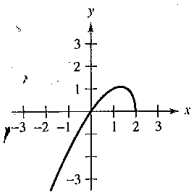
3.



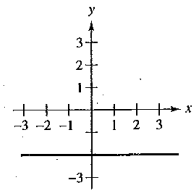
(c)



4.



(d)



5. ***Graphical Reasoning*** The graph of f is given in the figure.

(a) For which values of x is $f'(x)$ zero? Positive? Negative?

(b) For which values of x is $f''(x)$ zero? Positive? Negative?

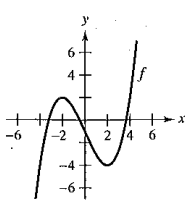


Figure for 5

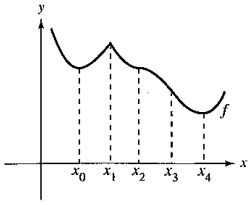


Figure for 6

6. ***Graphical Reasoning*** Identify the real numbers x_0, x_1, x_2, x_3, and x_4 in the figure such that each of the following is true.

(a) $f'(x) = 0$ (b) $f''(x) = 0$

(c) $f'(x)$ does not exist. (d) f has a relative maximum.

(e) f has a point of inflection.

In Exercises 7–38, analyze and sketch a graph of the function. Label any intercepts, relative extrema, points of inflection, and asymptotes. Use a graphing utility to verify your results.

7. $y = \dfrac{x^2}{x^2 + 3}$

8. $y = \dfrac{x}{x^2 + 1}$

9. $y = \dfrac{1}{x - 2} - 3$

10. $y = \dfrac{x^2 + 1}{x^2 - 9}$

11. $y = \dfrac{2x}{x^2 - 1}$

12. $f(x) = \dfrac{x + 2}{x}$

13. $g(x) = x + \dfrac{4}{x^2 + 1}$

14. $f(x) = x + \dfrac{32}{x^2}$

15. $f(x) = \dfrac{x^2 + 1}{x}$

16. $f(x) = \dfrac{x^3}{x^2 - 4}$

17. $y = \dfrac{x^2 - 6x + 12}{x - 4}$

18. $y = \dfrac{2x^2 - 5x + 5}{x - 2}$

19. $y = x\sqrt{4 - x}$

20. $g(x) = x\sqrt{9 - x}$

21. $h(x) = x\sqrt{9 - x^2}$

22. $y = x\sqrt{16 - x^2}$

23. $y = 3x^{2/3} - 2x$

24. $y = 3(x - 1)^{2/3} - (x - 1)^2$

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

26. $y = -\frac{1}{3}(x^3 - 3x + 2)$

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

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

29. $f(x) = 3x^3 - 9x + 1$

30. $f(x) = (x + 1)(x - 2)(x - 5)$

31. $y = 3x^4 + 4x^3$

32. $y = 3x^4 - 6x^2 + \frac{5}{3}$

33. $f(x) = x^4 - 4x^3 + 16x$