16. $f(x) = \dfrac{x-1}{x-1}$; $\lim\limits_{x\to 1} f(x)$

x	0.9	0.99	0.999	1.001	1.01	1.1
$f(x)$						

In Exercises 17–22, sketch the graph of the function f and evaluate $\lim\limits_{x\to a} f(x)$, if it exists, for the given value of a.

17. $f(x) = \begin{cases} x-1 & \text{if } x \le 0 \\ -1 & \text{if } x > 0 \end{cases} \quad (a = 0)$

18. $f(x) = \begin{cases} x-1 & \text{if } x \le 3 \\ -2x+8 & \text{if } x > 3 \end{cases} \quad (a = 3)$

19. $f(x) = \begin{cases} x & \text{if } x < 1 \\ 0 & \text{if } x = 1 \\ -x+2 & \text{if } x > 1 \end{cases} \quad (a = 1)$

20. $f(x) = \begin{cases} -2x+4 & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ x^2+1 & \text{if } x > 1 \end{cases} \quad (a = 1)$

21. $f(x) = \begin{cases} |x| & \text{if } x \ne 0 \\ 1 & \text{if } x = 0 \end{cases} \quad (a = 0)$

22. $f(x) = \begin{cases} |x-1| & \text{if } x \ne 1 \\ 0 & \text{if } x = 1 \end{cases} \quad (a = 1)$

In Exercises 23–40, find the indicated limit.

23. $\lim\limits_{x\to 2} 3$

24. $\lim\limits_{x\to -2} -3$

25. $\lim\limits_{x\to 3} x$

26. $\lim\limits_{x\to -2} -3x$

27. $\lim\limits_{x\to 1} (1-2x^2)$

28. $\lim\limits_{t\to 3} (4t^2 - 2t + 1)$

29. $\lim\limits_{x\to 1} (2x^3 - 3x^2 + x + 2)$

30. $\lim\limits_{x\to 0} (4x^5 - 20x^2 + 2x + 1)$

31. $\lim\limits_{s\to 0} (2s^2 - 1)(2s + 4)$

32. $\lim\limits_{x\to 2} (x^2 + 1)(x^2 - 4)$

33. $\lim\limits_{x\to 2} \dfrac{2x+1}{x+2}$

34. $\lim\limits_{x\to 1} \dfrac{x^3+1}{2x^3+2}$

35. $\lim\limits_{x\to 2} \sqrt{x+2}$

36. $\lim\limits_{x\to -2} \sqrt[3]{5x+2}$

37. $\lim\limits_{x\to -3} \sqrt{2x^4 + x^2}$

38. $\lim\limits_{x\to 2} \sqrt{\dfrac{2x^3+4}{x^2+1}}$

39. $\lim\limits_{x\to -1} \dfrac{\sqrt{x^2+8}}{2x+4}$

40. $\lim\limits_{x\to 3} \dfrac{x\sqrt{x^2+7}}{2x - \sqrt{2x+3}}$

In Exercises 41–48, find the indicated limit given that $\lim\limits_{x\to a} f(x) = 3$ and $\lim\limits_{x\to a} g(x) = 4$.

41. $\lim\limits_{x\to a} [f(x) - g(x)]$

42. $\lim\limits_{x\to a} 2f(x)$

45. $\lim\limits_{x\to a} \sqrt{g(x)}$

46. $\lim\limits_{x\to a} \sqrt[3]{5f(x) + 3g(x)}$

47. $\lim\limits_{x\to a} \dfrac{2f(x) - g(x)}{f(x)g(x)}$

48. $\lim\limits_{x\to a} \dfrac{g(x) - f(x)}{f(x) + \sqrt{g(x)}}$

In Exercises 49–62, find the indicated limit, if it exists.

49. $\lim\limits_{x\to 1} \dfrac{x^2-1}{x-1}$

50. $\lim\limits_{x\to -2} \dfrac{x^2-4}{x+2}$

51. $\lim\limits_{x\to 0} \dfrac{x^2-x}{x}$

52. $\lim\limits_{x\to 0} \dfrac{2x^2-3x}{x}$

53. $\lim\limits_{x\to -5} \dfrac{x^2-25}{x+5}$

54. $\lim\limits_{b\to -3} \dfrac{b+1}{b+3}$

55. $\lim\limits_{x\to 1} \dfrac{x}{x-1}$

56. $\lim\limits_{x\to 2} \dfrac{x+2}{x-2}$

57. $\lim\limits_{x\to -2} \dfrac{x^2-x-6}{x^2+x-2}$

58. $\lim\limits_{z\to 2} \dfrac{z^3-8}{z-2}$

59. $\lim\limits_{x\to 1} \dfrac{\sqrt{x}-1}{x-1}$

Hint: Multiply by $\dfrac{\sqrt{x}+1}{\sqrt{x}+1}$.

60. $\lim\limits_{x\to 4} \dfrac{x-4}{\sqrt{x}-2}$

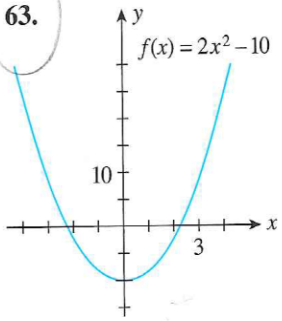
Hint: See Exercise 59.

61. $\lim\limits_{x\to 1} \dfrac{x-1}{x^3+x^2-2x}$

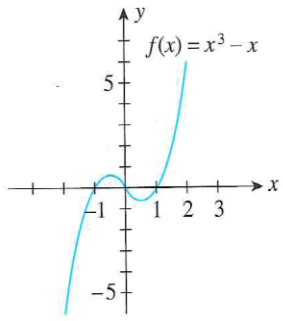
62. $\lim\limits_{x\to -2} \dfrac{4-x^2}{2x^2+x^3}$

In Exercises 63–68, use the graph of the function f to determine $\lim\limits_{x\to\infty} f(x)$ and $\lim\limits_{x\to -\infty} f(x)$, if they exist.

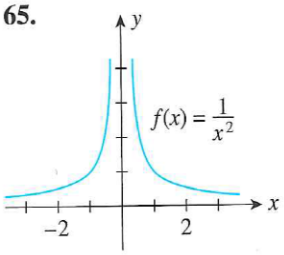
63.



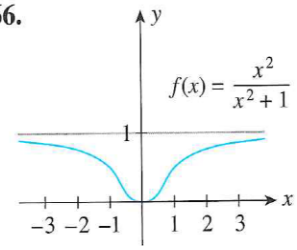
64.



65.



66.



67.