26. $g(x) = x + \text{int}(\sin \pi x)$

27. $s(x) = 3 + \sqrt{x - 2}$

28. $p(x) = \text{int}(x^2 - 6x + 9)$

29. $h(x) = \dfrac{\sin(x - 2)}{x - 2}$

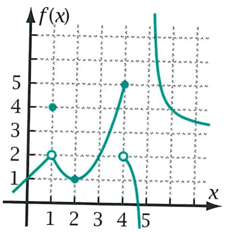
30. $f(x) = \begin{cases} x + (2 - x)^{-1}, & \text{if } x \neq 2 \\ 3, & \text{if } x = 2 \end{cases}$

For the piecewise functions graphed in Problems 31 and 32, make a table showing these quantities for each value of c, or stating that the quantity does not exist.

- $f(c)$
- $\lim\limits_{x \to c^-} f(x)$
- $\lim\limits_{x \to c^+} f(x)$
- $\lim\limits_{x \to c} f(x)$
- Continuity or kind of discontinuity

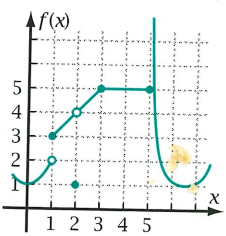
31. $c = \{1, 2, 4, 5\}$

$$f(x) = \begin{cases} x + 1, & \text{if } x < 1 \\ 4, & \text{if } x = 1 \\ (x - 2)^2 + 1, & \text{if } 1 < x \leq 4 \\ \dfrac{1}{x - 5} + 3, & \text{if } x > 4 \text{ and } x \neq 5 \end{cases}$$



32. $c = \{1, 2, 3, 5\}$

$$f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1 \\ \dfrac{x^2 - 4}{x - 2}, & \text{if } 1 \leq x \leq 3 \text{ and } x \neq 2 \\ 1, & \text{if } x = 2 \\ 5, & \text{if } 3 < x \leq 5 \\ \dfrac{1}{\sin(x - 5)}, & \text{if } x > 5 \end{cases}$$



For the piecewise functions in Problems 33–36,

a. Plot the graph using Boolean variables to restrict the branches. Use a friendly window including as a grid point any transition point where the rule changes. Sketch the graph.

b. Find the left and right limits at the transition point, and state whether the function is continuous at the transition point.

33. $d(x) = \begin{cases} 7 - x^2, & \text{if } x \leq 2 \\ 5 - x, & \text{if } x > 2 \end{cases}$

34. $h(x) = \begin{cases} 4 - x^2, & \text{if } x < 1 \\ x + 1, & \text{if } x \geq 1 \end{cases}$

35. $m(x) = \begin{cases} 3^x, & \text{if } x < 2 \\ 9 - x, & \text{if } x \geq 2 \end{cases}$

36. $q(x) = \begin{cases} 2^{-x}, & \text{if } x \leq -1 \\ x + 3, & \text{if } x > -1 \end{cases}$

For the piecewise functions in Problems 37–40, use one-sided limits in an appropriate manner to find the value of the constant k that makes the function continuous at the transition point where the defining rule changes. Plot the graph using Boolean variables. Sketch the result.

37. $g(x) = \begin{cases} 9 - x^2, & \text{if } x < 2 \\ kx, & \text{if } x \geq 2 \end{cases}$

38. $f(x) = \begin{cases} 0.4x + 1, & \text{if } x < 1 \\ kx + 2, & \text{if } x \geq 1 \end{cases}$

39. $u(x) = \begin{cases} kx^2, & \text{if } x \leq 3 \\ kx - 3, & \text{if } x > 3 \end{cases}$

40. $v(x) = \begin{cases} kx + 5, & \text{if } x < -1 \\ kx^2, & \text{if } x \geq -1 \end{cases}$

41. *Two Constants Problem:* Let a and b stand for constants and let

$$f(x) = \begin{cases} b - x, & \text{if } x \leq 1 \\ a(x - 2)^2, & \text{if } x > 1 \end{cases}$$

a. Find an equation relating a and b if f is to be continuous at $x = 1$.

b. Find b if $a = -1$. Show by graphing that f is continuous at $x = 1$ for these values of a and b.