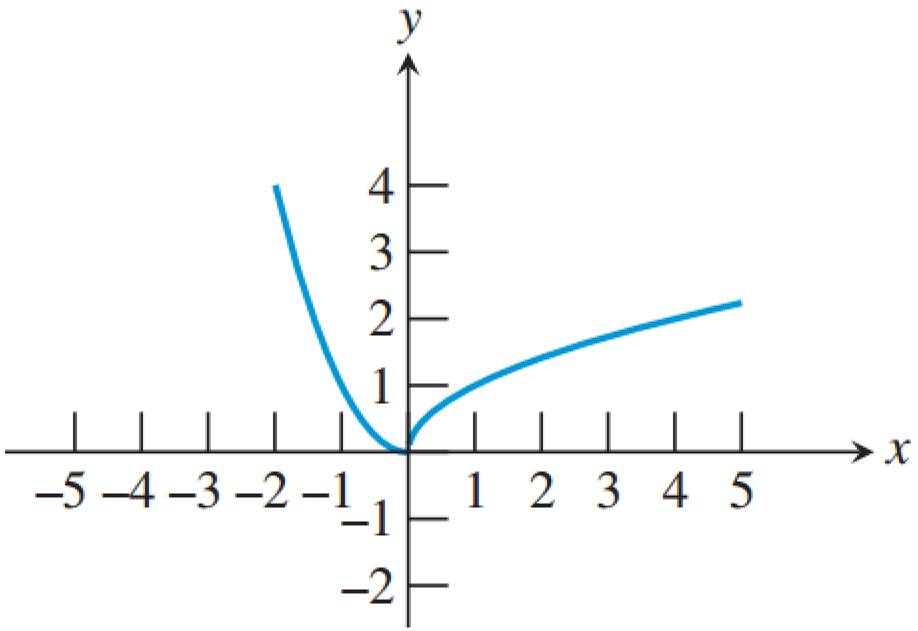
Identifying a Piecewise-Defined Function

Which of the twelve basic functions has the following **piecewise** definition over separate intervals of its domain?

$$f(x) = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Defining a Function Piecewise

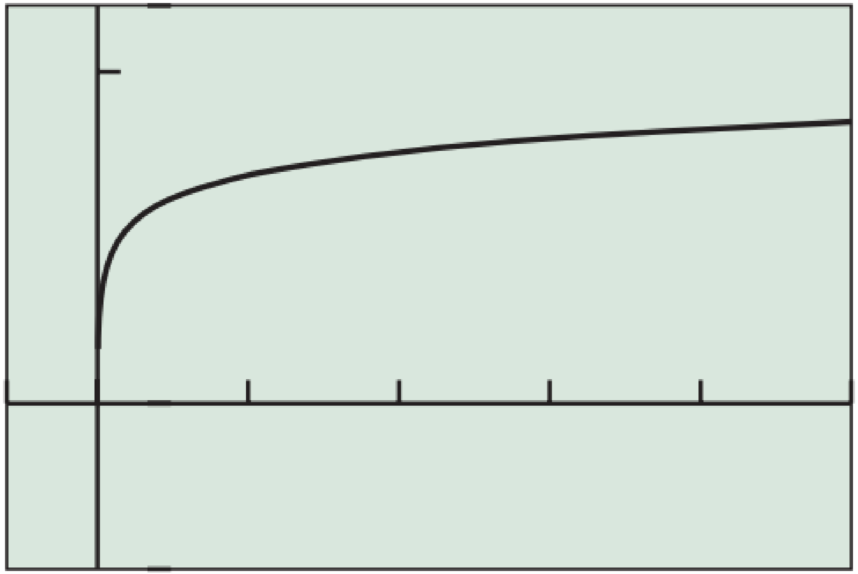
Using basic functions from this section, construct a piecewise definition for the function whose graph is shown in Figure 1.52. Is your function continuous?



$$f(x) = \begin{cases} x^2 & \text{if } x \leq 0 \\ \sqrt{x} & \text{if } x > 0 \end{cases}$$

Looking for a Horizontal Asymptote

Does the graph of $y = \ln x$ (Figure 1.42) have a horizontal asymptote?

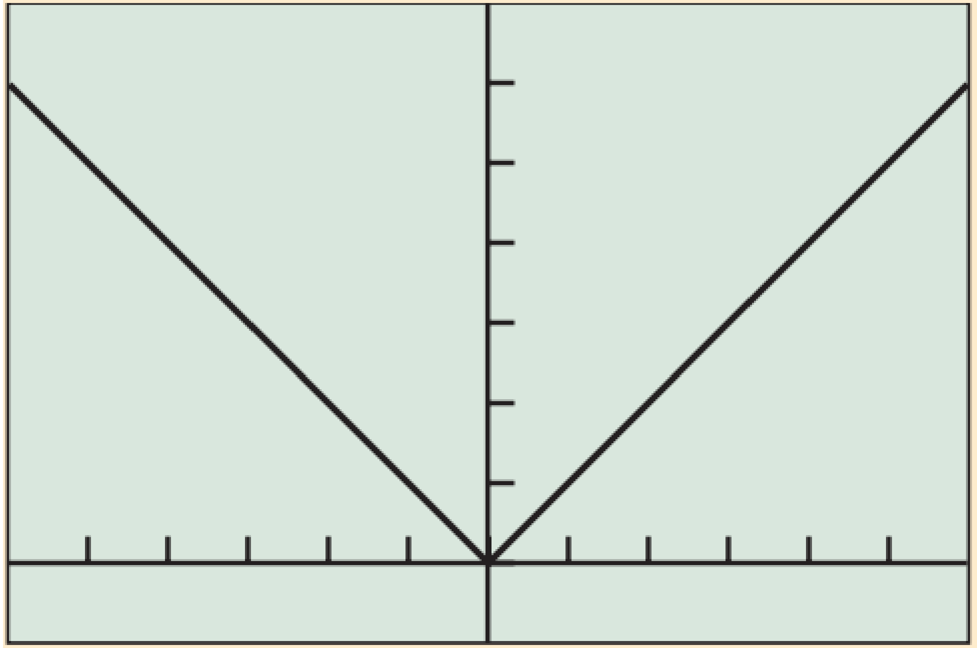


[–600, 5000] by [–5, 12]

FIGURE 1.53 The graph of $y = \ln x$ still appears to have a horizontal asymptote, despite the much larger window than in Figure 1.42. (Example 8)

Analyzing a Function

Give a complete analysis of the basic function $f(x) = |x|$.



[–6, 6] by [–1, 7]

$f(x) = |x|$

Domain: All reals

Range: $[0, \infty)$

Continuous

Decreasing on $(\infty, 0]$; increasing on $[0, \infty)$

Symmetric with respect to the y-axis (an even function)

Bounded below

Local minimum at $(0, 0)$

No horizontal asymptotes

No vertical asymptotes

End behavior: $\lim_{x \to -\infty} |x| = \infty$ and $\lim_{x \to \infty} |x| = \infty$