

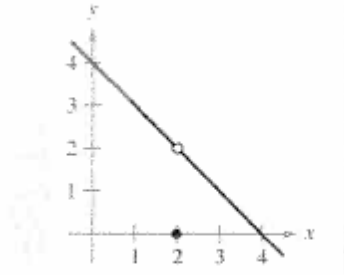
**Limits Day 1 Worksheet (Sections 2.2 and 2.4)**

Use the graph to find each limit.

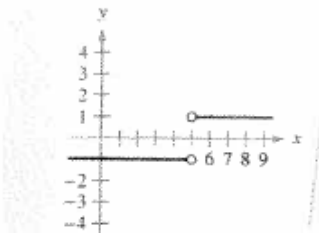
1)  $\lim_{x \rightarrow 3} (4 - x)$



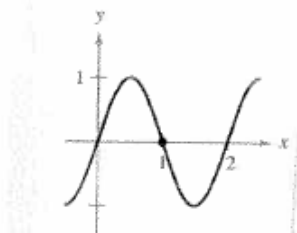
2)  $\lim_{x \rightarrow 2} f(x)$  if  $f(x) = \begin{cases} 4 - x, & x \neq 2 \\ 0, & x = 2 \end{cases}$



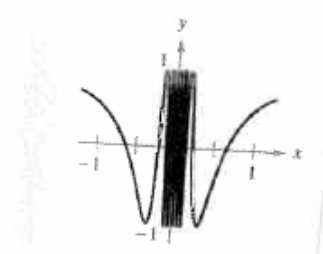
3)  $\lim_{x \rightarrow 5} \frac{|x - 5|}{x - 5}$



4)  $\lim_{x \rightarrow 1} \sin \pi x$



5)  $\lim_{x \rightarrow 0} \cos \frac{1}{x}$



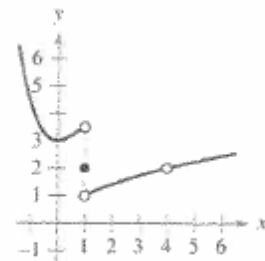
6) Use the graph of the function  $f$  to answer the following questions.

a)  $f(1)$

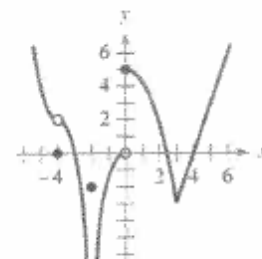
b)  $\lim_{x \rightarrow 1} f(x)$

c)  $f(4)$

d)  $\lim_{x \rightarrow 4} f(x)$

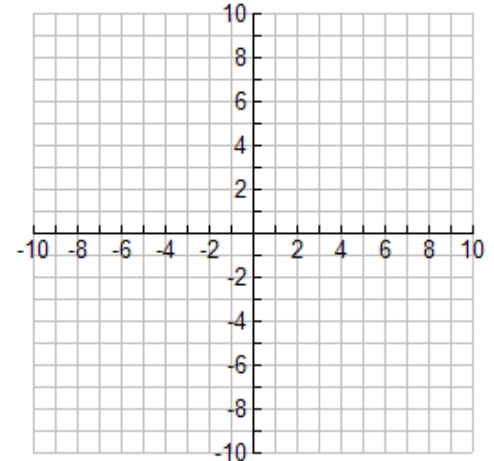


7) Use the graph of  $f$  to identify the values of  $c$  for which  $\lim_{x \rightarrow c} f(x)$  does not exist.



8) Sketch the graph of  $f$ . Then identify the values of  $c$  for which  $\lim_{x \rightarrow c} f(x)$  does not exist.

$$f(x) = \begin{cases} x^2, & x \leq 2 \\ 8 - 2x, & 2 < x < 4 \\ 4, & x \geq 4 \end{cases}$$



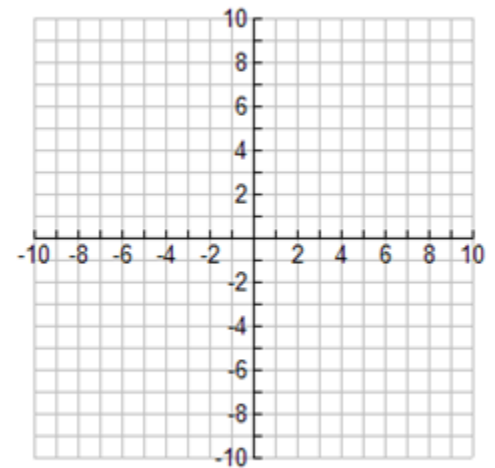
9) Sketch a graph of a function  $f$  that satisfies the given values. (There are many correct answers.)

$f(0)$  is undefined

$$\lim_{x \rightarrow 0} f(x) = 4$$

$$f(2) = 6$$

$$\lim_{x \rightarrow 2} f(x) = 3$$

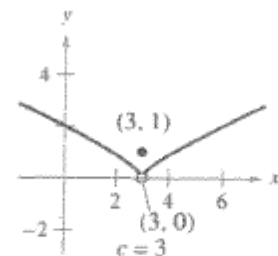


Use the graph to determine each limit, and discuss the continuity of the function.

10) a)  $\lim_{x \rightarrow 3^+} f(x)$

b)  $\lim_{x \rightarrow 3^-} f(x)$

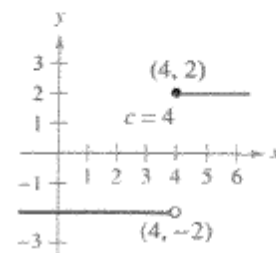
c)  $\lim_{x \rightarrow 3} f(x)$



11) a)  $\lim_{x \rightarrow 4^+} f(x)$

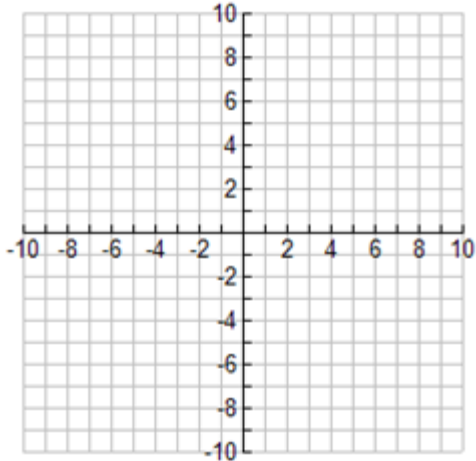
b)  $\lim_{x \rightarrow 4^-} f(x)$

c)  $\lim_{x \rightarrow 4} f(x)$

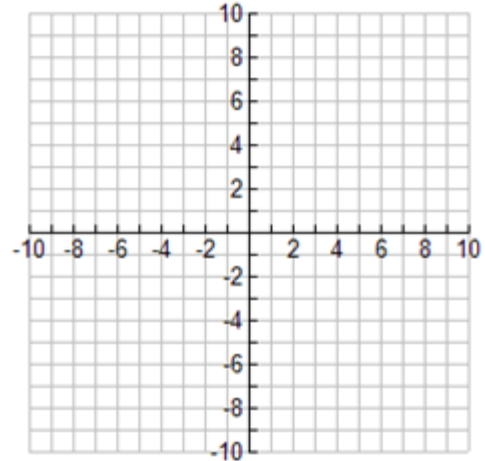


Graph and find each limit.

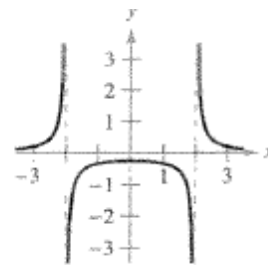
$$12) \lim_{x \rightarrow 3^-} f(x), \text{ where } f(x) = \begin{cases} \frac{x+2}{2}, & x \leq 3 \\ \frac{12-2x}{3}, & x > 3 \end{cases}$$



$$13) \lim_{x \rightarrow 1} f(x), \text{ where } f(x) = \begin{cases} x^3 + 1, & x < 1 \\ x + 1, & x \geq 1 \end{cases}$$



$$14) \text{ Discuss the continuity of the function } f(x) = \frac{1}{x^2 - 4}.$$



Find the x-values (if any) at which f is not continuous. Which of the discontinuities are removable?

$$15) f(x) = \frac{x}{x^2 - x}$$

$$16) f(x) = \frac{x+2}{x^2 - 3x - 10}$$

$$17) f(x) = \begin{cases} x, & x \leq 1 \\ x^2, & x > 1 \end{cases}$$

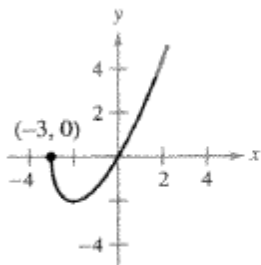
$$18) f(x) = \begin{cases} \frac{1}{2}x + 1, & x \leq 2 \\ 3 - x, & x > 2 \end{cases}$$

19) Find the constant a, such that the function is continuous on the entire real line.

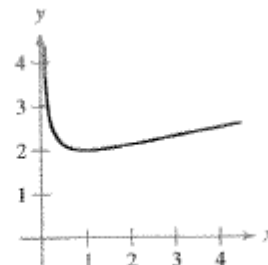
$$f(x) = \begin{cases} x^3, & x \leq 2 \\ ax^2, & x > 2 \end{cases}$$

Describe the interval(s) on which the function is continuous.

20)  $f(x) = x\sqrt{x+3}$



21)  $f(x) = \frac{x+1}{\sqrt{x}}$



Explain why the function has a zero in the given interval. (IVT)

22)  $f(x) = \frac{1}{16}x^4 - x^3 + 3$      $[1, 2]$

23)  $f(x) = x^2 - 2 - \cos x$      $[0, \pi]$

Verify that the Intermediate Value Theorem applies to the indicated interval and find the value of c guaranteed by the theorem.

24)  $f(x) = x^2 + x - 1$ ,  $[0, 5]$ ,  $f(c) = 11$

25)  $f(x) = \frac{x^2 + x}{x - 1}$ ,  $\left[\frac{5}{2}, 4\right]$ ,  $f(c) = 6$