1. 1

7. **a.** True.

b. True. Since $\lim_{x\to 0^-} f(x) = 2$ and $\lim_{x\to 0^+} f(x) = 2$, $\lim_{x\to 0} f(x) = 2$.

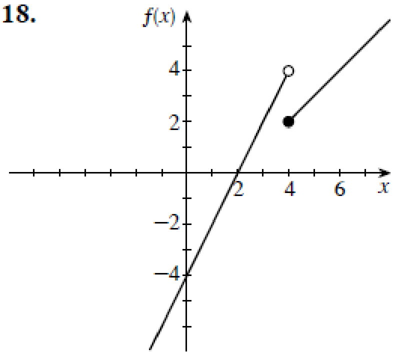
c. False. Since $\lim_{x\to 2^-} f(x) = 2$ and $\lim_{x\to 2^+} f(x) = 2$, $\lim_{x\to 2} f(x) = 2 \neq 1$.

d. True.

e. True. $\lim_{x\to 4^+} f(x) = \infty$, which is another way of saying that $\lim_{x\to 4^+} f(x)$ does not exist.

f. False. From part e, we know that the right-hand limit does not exist. Therefore, $\lim_{x\to 4} f(x)$ does not exist.

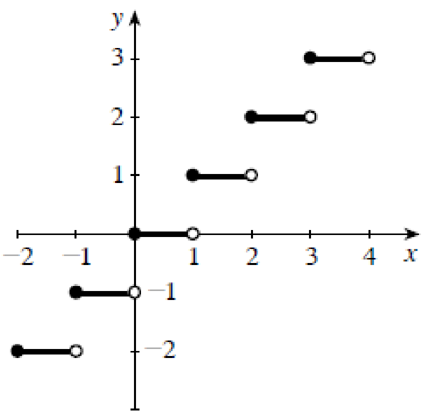
18.



a. $\lim_{x\to 4^-} f(x) = 4$

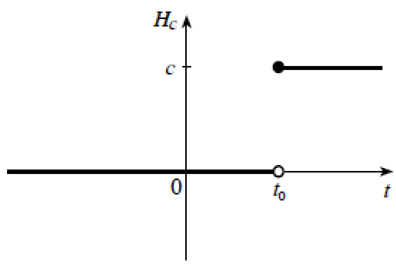
b. $\lim_{x\to 4^+} f(x) = 2$

c. $\lim_{x\to 4} f(x)$ does not exist.



26. $\lim_{x\to -1} [\![x]\!]$ does not exist.

33. The graph of $H_c(t - t_0)$ is shown in the figure. If $c \neq 0$, then $\lim_{t\to t_0^-} H_c = 0$ and $\lim_{t\to t_0^+} H_c = c$. Since the right-hand limit is not equal to the left-hand limit, $\lim_{t\to t_0} H_c$ does not exist.



34. From the given figure, for $n = 1, 2, 3, \ldots$, we have $\lim_{t\to[(2n-1)k]^-} f(t) = k$ and $\lim_{t\to[(2n-1)k]^+} f(t) = 0$, so $\lim_{t\to[(2n-1)k]} f(t)$ does not exist. Similarly, $\lim_{t\to[(2n)k]^-} f(t) = 0$ and $\lim_{t\to[(2n)k]^+} f(t) = k$, so $\lim_{t\to[(2n)k]} f(t)$ does not exist. Therefore, $\lim_{t\to nk} f(t)$ does not exist for $n = 1, 2, 3, \ldots$.

1.2

28. $\lim_{x\to a} \frac{\sqrt[3]{f(x)g(x)}}{\sqrt{f(x)g(x)+1}} = \frac{\sqrt[3]{\lim_{x\to a} f(x) \cdot \lim_{x\to a} g(x)}}{\sqrt{\lim_{x\to a} f(x) \cdot \lim_{x\to a} g(x) + 1}} = \frac{\sqrt[3]{2\cdot 4}}{\sqrt{2\cdot 4+1}} = \frac{2}{3}$

30. $\lim_{x\to -2} \frac{xf(x)}{1+x^2} = \frac{\left(\lim_{x\to -2} x\right)\left[\lim_{x\to -2} f(x)\right]}{\lim_{x\to -2} 1 + \left(\lim_{x\to -2} x\right)^2} = \frac{(-2)\,2}{1+(-2)^2} = -\frac{4}{5}$

55. Since $\lim_{t\to 1^+} \frac{\sqrt{t}+1}{t-1} = \infty$ and $\lim_{t\to 1^-} \frac{\sqrt{t}+1}{t-1} = -\infty$, $\lim_{t\to 1} \frac{\sqrt{t}+1}{t-1}$ does not exist.

72. $\lim_{x\to 0} \frac{x}{1-\cos^2 x} = \lim_{x\to 0} \frac{x}{\sin^2 x} = \lim_{x\to 0} \left(\frac{x}{\sin x} \cdot \frac{1}{\sin x}\right)$ which does not exist because $\lim_{x\to 0} \frac{x}{\sin x} = 1$, but $\lim_{x\to 0} \frac{1}{\sin x}$ does not exist.

88. $\lim_{x\to 1^-} f(x) = \lim_{x\to 1^-} \left(\sqrt{1-x}+2\right) = 2$ and $\lim_{x\to 1^+} f(x) = \lim_{x\to 1^+} \left(1+x^{3/2}\right) = 2$. Since $\lim_{x\to 1^-} f(x) = \lim_{x\to 1^+} f(x) = 2$, we conclude that $\lim_{x\to 1} f(x)$ exists and has a value of 2.