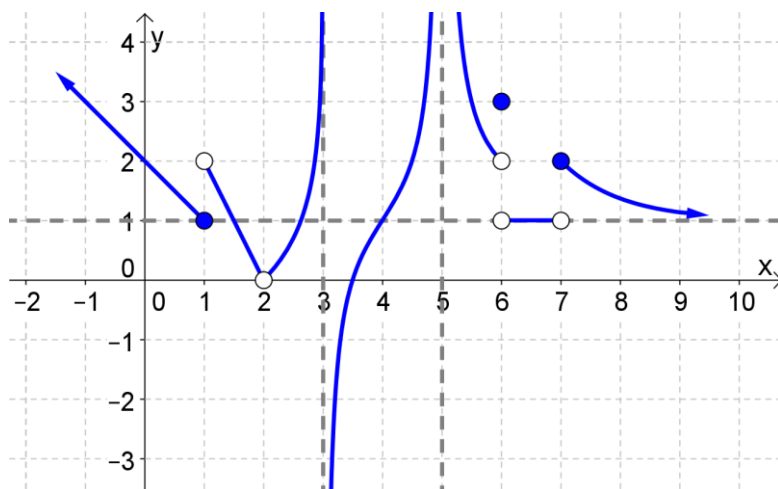


1. Suppose you have the following piecewise-defined function, $f(x)$.



a) Find the following.

$$\lim_{x \rightarrow 1^-} f(x)$$

$$\lim_{x \rightarrow 1^+} f(x)$$

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

$$\lim_{x \rightarrow 2^-} f(x)$$

$$\lim_{x \rightarrow 2^+} f(x)$$

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

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

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

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

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

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

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

$$\lim_{x \rightarrow 5^-} f(x)$$

$$\lim_{x \rightarrow 5^+} f(x)$$

$$\lim_{x \rightarrow 5} f(x)$$

$$\lim_{x \rightarrow 6^-} f(x)$$

$$\lim_{x \rightarrow 6^+} f(x)$$

$$\lim_{x \rightarrow 6} f(x)$$

$$\lim_{x \rightarrow 7^-} f(x)$$

$$\lim_{x \rightarrow 7^+} f(x)$$

$$\lim_{x \rightarrow 7} f(x)$$

$$\lim_{x \rightarrow +\infty} f(x)$$

$$\lim_{x \rightarrow -\infty} f(x)$$

$$f(1)$$

$$f(2)$$

$$f(3)$$

$$f(4)$$

$$f(5)$$

$$f(6)$$

$$f(7)$$

b) List all values of x for which $f(x)$ is not continuous.

2. Find each of the following limits.

a) $\lim_{x \rightarrow 3} (x^2 - 2x + 1)$

b) $\lim_{x \rightarrow -3} \frac{5-2x}{x-3}$

c) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$

d) $\lim_{x \rightarrow \frac{1}{2}} \frac{2x^2 + 5x - 3}{2x - 1}$

e) $\lim_{x \rightarrow 1} \frac{x^2 + 2x - 3}{2x^2 + x - 3}$

f) $\lim_{x \rightarrow 1^-} \frac{x - \sqrt{x}}{x - 1}$ (Hint: multiply top and bottom by $x + \sqrt{x}$, then factor the top)

g) $\lim_{x \rightarrow -2^+} \frac{x + 3}{x + 2}$

h) $\lim_{x \rightarrow 5} \frac{2x - 1}{x - 5}$

$$i) \lim_{x \rightarrow -2} \frac{x+1}{x+2}$$

$$j) \lim_{x \rightarrow +\infty} \frac{3x^3+4x-1}{2x^4-7x+8}$$

$$k) \lim_{x \rightarrow -\infty} \frac{3x^2-2x+5}{4x^2+x+7}$$

$$l) \lim_{x \rightarrow -\infty} \frac{1-2x^3}{x+1}$$

3. Find the following limits given that $f(x) = \begin{cases} 2x^2 & \text{if } x \leq 3 \\ x - 1 & \text{if } x > 3 \end{cases}$

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

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

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

d) Is $f(x)$ continuous at $x = 3$? Why or why not?

4. Is $f(x) = \frac{x-2}{x+5}$ continuous at $x = -5$? Why or why not?

5. Is $f(x) = x^3 - 4x + 9$ continuous at $x = 2$? Why or why not?

6. Is $f(x) = \begin{cases} 2 - 3x & \text{if } x < -1 \\ x^2 - x + 3 & \text{if } x \geq -1 \end{cases}$ continuous at $x = -1$? Why or why not? (Be sure to use the definition of continuous. That is, show $\lim_{x \rightarrow -1} f(x) = f(-1)$.)

7. List all values of x for which $f(x) = \frac{x+2}{x^3-4x}$ is not continuous.

8. List all values of x for which $f(x) = \begin{cases} x^2 - 5 & \text{if } x < 0 \\ \frac{2}{3}x + 1 & \text{if } x \geq 0 \end{cases}$ is not continuous.

9. You start a company that sells a business calculus textbook.

a) Suppose your total costs one month are \$20000, and you produce 400 textbooks that month. Find the average cost per textbook for that month. Be sure to write the units for your answer.

b) Now suppose that $C(x) = 25x + 10000$ represents your total costs (in dollars), where x is the number of textbooks produced. Find the average cost per textbook (call it $A(x)$).

c) Find $\lim_{x \rightarrow +\infty} A(x)$. Be sure to write the units for your answer.

d) What does your answer to part (c) mean?

Note: Please visit davidsmath.com/math140 for an answer key to the homework.