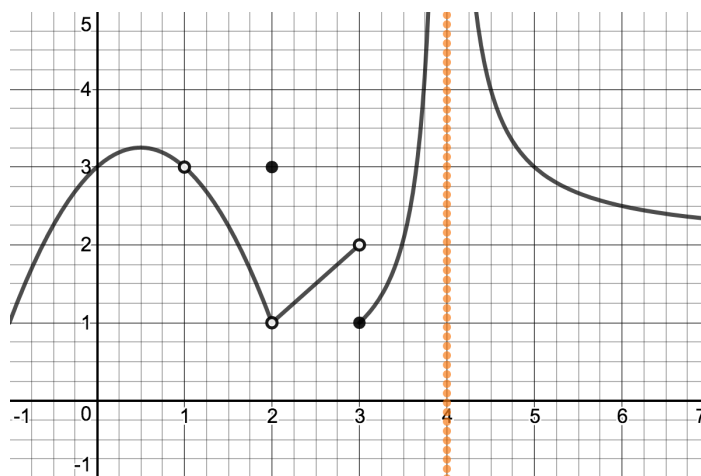


§2.6: CONTINUITY

1.] Consider the graph of a piecewise function $f(x)$ below:



a.) Compute the following:

$$i. \lim_{x \rightarrow 1^-} f(x) \qquad ii. \lim_{x \rightarrow 1^+} f(x) \qquad iii. \lim_{x \rightarrow 1} f(x) \qquad iv. f(1)$$

b.) Compute the following:

$$i. \lim_{x \rightarrow 2^-} f(x) \qquad ii. \lim_{x \rightarrow 2^+} f(x) \qquad iii. \lim_{x \rightarrow 2} f(x) \qquad iv. f(2)$$

c.) Compute the following:

$$i. \lim_{x \rightarrow 3^-} f(x) \qquad ii. \lim_{x \rightarrow 3^+} f(x) \qquad iii. \lim_{x \rightarrow 3} f(x) \qquad iv. f(3)$$

d.) Compute the following:

$$i. \lim_{x \rightarrow 4^-} f(x) \qquad ii. \lim_{x \rightarrow 4^+} f(x) \qquad iii. \lim_{x \rightarrow 4} f(x) \qquad iv. f(4)$$

e.) Compute the following:

$$i. \lim_{x \rightarrow 6^-} f(x) \qquad ii. \lim_{x \rightarrow 6^+} f(x) \qquad iii. \lim_{x \rightarrow 6} f(x) \qquad iv. f(6)$$

f.) For what values of x is this function discontinuous? For each point of discontinuity, briefly explain *why* it is not continuous.

2.] Determine if the following functions are continuous at $x = a$:

a.) $f(x) = \frac{3x^2 + 2x + 1}{x - 1}, \quad a = 1.$

b.) $f(x) = \begin{cases} \frac{x^2 - 4x + 3}{x - 3} & \text{if } x \neq 3 \\ 2 & \text{if } x = 3 \end{cases}, \quad a = 3.$

c.) $f(x) = \frac{2x^2 + 3x + 1}{x^2 + 5x}, \quad a = 5.$

d.) $f(x) = \frac{e^{2x} - 1}{e^x - 1}, \quad a = 0.$

3.] Determine the interval(s) on which the following function is continuous. Be sure to consider left- and right-continuity.

$$f(x) = \begin{cases} 2x & \text{if } x < 1 \\ x^2 + 3x & \text{if } x \geq 1 \end{cases}$$

4.] Use the Intermediate Value Theorem to show that the following equation has a solution on the given interval:

$$2x^3 + x = 2, \quad (-1, 1).$$