The Limit of a Function

Solutions should show all of your work, not just a single final answer.

1. The graph of \( y = f(x) \) is below. Compute each value or explain why it doesn’t exist.

   \[
   y
   \]

   \[
   x
   \]

   \[
   0
   \]

   \[
   1
   \]

   \[
   2
   \]

   \[
   3
   \]

   \[
   1
   \]

   \[
   2
   \]

   \[
   3
   \]

   \[
   0 \quad 1 \quad 2 \quad 3 \quad x
   \]

   (a) \( \lim_{x \to 0^-} f(x) \)

   (b) \( \lim_{x \to 0^+} f(x) \)

   (c) \( \lim_{x \to 0} f(x) \)

   (d) \( f(0) \)

   (e) \( \lim_{x \to 1^-} f(x) \)

   (f) \( \lim_{x \to 1^+} f(x) \)

   (g) \( \lim_{x \to 1} f(x) \)

   (h) \( f(1) \)

   (i) \( \lim_{x \to 2^-} f(x) \)

   (j) \( \lim_{x \to 2^+} f(x) \)

   (k) \( \lim_{x \to 2} f(x) \)

   (l) \( f(2) \)

2. Determine whether the following limits are finite, \( \infty \), or \( -\infty \). If the limit does not exist for any other reason, write DNE with a justification.

   (a) \( \lim_{x \to 1} \frac{\sqrt{x}}{2(x-1)^2} \)

   (b) \( \lim_{x \to 1^+} \frac{x - 2}{x - 1} \)

   (c) \( \lim_{x \to 0} \frac{1}{x} - \frac{1}{x^2} \)

3. T/F (with justification) The line \( x = 1 \) is a vertical asymptote of the graph of \( y = \frac{x^2 - 1}{x^2 - 2x + 1} \).

4. T/F (with justification) The line \( x = 1 \) is a vertical asymptote of the graph of \( y = \frac{x^2 - 2x + 1}{x^2 - 1} \).