Quiz 1

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Use any method for finding limits discussed in class to complete the following problem.

Problem 1. Let
$$f(x) = \frac{x^2 - 2x - 3}{x^2 - 4x + 3}.$$

(a) What is $f(-1)$?

(b) Find $\lim_{x \to -1^+} f(x)$ and $\lim_{x \to -1^-} f(x)$.

(c) Determine if $\lim_{x \to -1} f(x)$ exists and if so what is it?

(d) Is it true that $f(-1) = \lim_{x \to -1} f(x)$? Justify.

Solution:

(a)
$$f(-1) = \frac{(-1)^2 - 2(-1) - 3}{(-1)^2 - 4(-1) + 3} = \frac{0}{8} = 0.$$

(b)
$$\lim_{x \to -1^+} f(x) = \frac{(-1)^2 - 2(-1) - 3}{(-1)^2 - 4(-1) + 3} = 0$$

and
$$\lim_{x \to -1^-} f(x) = \frac{(-1)^2 - 2(-1) - 3}{(-1)^2 - 4(-1) + 3} = 0.$$

(c) Since $\lim_{x \to -1^+} f(x) = \lim_{x \to -1^+} f(x) = 0$, then $\lim_{x \to -1} f(x) = 0$.

(d) True. Since
$$f(-1) = 0 = \lim_{x \to -1} f(x).$$