

Answer on Question #76316 – Math – Calculus

Question

Find the indicated limit, if it exists.

Limit of f as x approaches 0 where f of x equals $5x$ minus 9 when x is less than 0 and the absolute value of the quantity 2 minus x when x is greater than or equal to 0.

Solution

Consider

$$f(x) = \begin{cases} 5x - 9, & x < 0, \\ |2 - x|, & x \geq 0. \end{cases}$$

Let us evaluate the one-sided limits of the function f at the point 0 and compare them.

$$\lim_{x \rightarrow 0-0} f(x) = \lim_{x \rightarrow 0-0} (5x - 9) = -9; \quad \lim_{x \rightarrow 0+0} f(x) = \lim_{x \rightarrow 0+0} |2 - x| = 2;$$

$$\lim_{x \rightarrow 0-0} f(x) \neq \lim_{x \rightarrow 0+0} f(x), \text{ so } \lim_{x \rightarrow 0} f(x) \text{ does not exist.}$$

Answer: the indicated limit $\lim_{x \rightarrow 0} f(x)$ doesn't exist.