

Answer on Question #53837 – Math – Calculus

Find the indicated limit, if it exists.

limit of f of x as x approaches 9 where f of x equals x plus 9 when x is less than 9 and f of x equals 9 minus x when x is greater than or equal to 9

Solution

We need to find the indicated limit, if it exists

$$\lim_{x \rightarrow 9} f(x)$$

where

$$f(x) = \begin{cases} x + 9, & x < 9, \\ 9 - x, & x \geq 9. \end{cases}$$

We have

$$f(x)|_{x=9} = (9 - x)|_{x=9} = 9 - 9 = 0;$$

$$\lim_{x \rightarrow 9-0} f(x) = \lim_{x \rightarrow 9-0} (x + 9) = 9 + 9 = 18;$$

$$\lim_{x \rightarrow 9+0} f(x) = \lim_{x \rightarrow 9+0} (9 - x) = 9 - 9 = 0.$$

Because

$$\lim_{x \rightarrow 9+0} f(x) = f(x)|_{x=9} \neq \lim_{x \rightarrow 9-0} f(x)$$

then the indicated limit does not exist.

Answer: the indicated limit does not exist.