Answer on Question #45109 – Math - Calculus

Find the indicated limit, if it exists.

limit of f of x as x approaches 0 where f of x equals 5 x minus 8 when x is less than 0 and the absolute value of the quantity negative 4 minus x when x is greater than or equal to 0.

Solution:

We have

$$f(x) = \begin{cases} 5x - 8, & if \ x < 0, \\ |-4 - x|, & if \ x \geq 0. \end{cases}$$

Find the indicated limit

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

if it exists. So we have

$$\lim_{x \to -0} f(x) = \lim_{x \to -0} (5x - 8) = -8$$

and

$$\lim_{x \to +0} f(x) = \lim_{x \to +0} |-4 - x| = \lim_{x \to +0} (4 + x) = 4$$

If the one-sided limits are finite but not equal,

$$\lim_{x \to -0} f(x) \neq \lim_{x \to +0} f(x)$$

then there is a jump discontinuity, which is also called a ***non-removable discontinuity***.
Hence $\lim_{x \to 0} f(x)$ does not exist.