

### Answer on Question #45111 – Math - Calculus

Use graphs and tables to find the limit and identify any vertical asymptotes of limit of 1 divided by the quantity  $x$  minus 5 as  $x$  approaches 5 from the left.

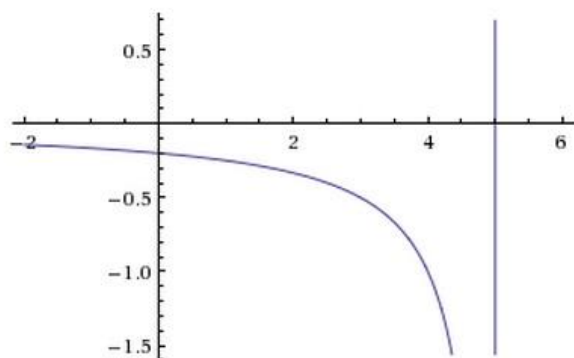
#### Solution

The function is  $f(x) = \frac{1}{x-5}$ .

The table lists the value of  $f(x)$  for several  $x$ -values approaches 5 from the left.

$x$	$f(x) = \frac{1}{x-5}$	$[x, f(x)]$
4.5	$f(x) = \frac{1}{4.5-5} = \frac{1}{-0.5} = -2$	(4.5, -2)
4.9	$f(x) = \frac{1}{4.9-5} = \frac{1}{-0.1} = -10$	(4.9, -10)
4.99	$f(x) = \frac{1}{4.99-5} = \frac{1}{-0.01} = -100$	(4.99, -100)
4.999	$f(x) = \frac{1}{4.999-5} = \frac{1}{-0.001} = -1000$	(4.999, -1000)
4.9999	$f(x) = \frac{1}{4.9999-5} = \frac{1}{-0.0001} = -10000$	(4.9999, -10000)
4.99999	$f(x) = \frac{1}{4.99999-5} = \frac{1}{-0.00001} = -100000$	(4.99999, -100000)
5	$f(x) = \frac{1}{5-5} = \frac{1}{0} = -\infty$	(5, $-\infty$ )

The graph of function  $f(x) = \frac{1}{x-5}$  is given below



Observe the graph and table, when  $x$  approaches 5 from the left,  $(x - 5)$  is a small negative number. Thus, the quotient  $\frac{1}{x-5}$  is a large negative number and  $f(x)$  approaches negative infinity to the left side of  $x = 5$ . So, we can conclude that  $x = 5$  is a vertical asymptote of the graph of  $f(x)$  and

$$\lim_{x \rightarrow 5^-} f(x) = \lim_{x \rightarrow 5^-} \frac{1}{x-5} = -\infty.$$