

Re: help proving that limit of piecewise function DNE

Source: <http://sci.tech-archive.net/Archive/sci.math/2005-12/msg03513.html>

- *From:* mskirvin@xxxxxxxxxx
 - *Date:* 18 Dec 2005 16:44:45 -0800
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R. Colacitti wrote:

> R. Colacitti wrote:

>> given:

>>

>> $f: \mathbb{R} \rightarrow \mathbb{R}$

>>

>> $f(x) = \begin{cases} 0 & \text{if } x \text{ is rational} \end{cases}$

>> $\begin{cases} 1 & \text{if } x \text{ is irrational} \end{cases}$

>>

>>

>> objective:

>>

>> prove that as $x \rightarrow 0$, $f(x)$ has no limit (limit does not exist)

>>

>>

>> what I tried and failed miserably with:

>>

>> I noticed that $0 \leq f(x) \leq 1$ for $x \in \mathbb{R}$

>>

>> and since $\lim_{x \rightarrow 0} 0 \neq \lim_{x \rightarrow 0} 1$, I claimed that $\lim_{x \rightarrow 0} f(x)$ does

>> not exist

>>

>> *BASED ON A COROLLARY OF THE SQUEEZE THEOREM (something which isn't

>> generally true)

>>

>

> I should have said "CONVERSE" not "COROLLARY"

>

>>

>> Any hints on how I should start in trying to prove that the limit does

>> not exist?

As a hint, every neighborhood of 0 contains an irrational number.

Mike

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- **References:**

- ◆ **[help proving that limit of piecewise function DNE](#)**

- ◆ *From: R. Colacitti*

- ◆ **[Re: help proving that limit of piecewise function DNE](#)**

- ◆ *From: R. Colacitti*

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