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3.4

Moderator: helmut [Moderator Control Panel]

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Author	Message
violeta guzman offline Math Cadet **Joined:** Tue, 31 Mar 2020 15:36 **Posts:** 8	**Post subject:** 3.4 **Posted:** Tue, 31 Mar 2020 16:53 f(x) does not have a limit. According to the figure that was provided, as x approaches zero from the right, the limit of f(x)=1. Also we can see that as x approaches zero from the left, the limit of f(x)=-1 from this we can see that the limit does not exist because f(x) isn't going to a point.
Top	profile pm email edit quote
Jocelyne Perez offline Member **Joined:** Tue, 31 Mar 2020 15:27 **Posts:** 10	**Post subject:** Re: Exercise 3.4 **Posted:** Tue, 31 Mar 2020 17:04 so can we say it is bounded or its the accumulation points that its reaching too? or can we say that it has no limit because both lines do not represent a function and therefore limit doesn't exist.
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helmut online Site Admin	**Post subject:** Re: Exercise 3.4 **Posted:** Tue, 31 Mar 2020 17:23 Yes, the limit does not exist. What you have to do is to show that in this case the **definition** of limit is not satisfied. The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark. - Michelangelo Buonarroti

Joined: Sat, 26 Apr 2003 15:14
Posts: 2234
Location: El Paso TX (USA)

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Jocelyne Perez — **Post subject:** Re: Exercise 3.4 — **Posted:** Tue, 31 Mar 2020 17:34

offline

Member

Joined: Tue, 31 Mar 2020 15:27
Posts: 10

So you can say that since the existence of the limit does not depend on what x=x0, but only on what happens "close" to x0. Since x0 is not close to anything and it is a horizontal line then limit does not exist.

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helmut — **Post subject:** Re: Exercise 3.4 — **Posted:** Wed, 01 Apr 2020 12:39

online

Site Admin

Joined: Sat, 26 Apr 2003 15:14
Posts: 2234
Location: El Paso TX (USA)

$x_0 = 0$ is an accumulation point of the domain $\mathbb{R}$. There are lots of real numbers close to 0.

The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark. - Michelangelo Buonarroti

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violeta guzman — **Post subject:** Re: Exercise 3.4 — **Posted:** Thu, 02 Apr 2020 11:39

offline

Math Cadet

Joined: Tue, 31 Mar 2020 15:36
Posts: 8

Proof
Left hand Limit

$$\lim_{x\to 0^-} \frac{|x|}{x} = \frac{|-1|}{-1} = \frac{1}{-1} = -1$$

Right hand limit

$$\lim_{x\to 0^+} \frac{|x|}{x} = \frac{|+1|}{1} = \frac{1}{1} = 1$$

Also, x=0

From here we can see that the right hand limit does not equal left hand limit does not equal 0 (x=0)
couldn't find the latex code for 'does not equal'
Therefore, the limit does not exist

Last edited by violeta guzman on Thu, 02 Apr 2020 11:45, edited 1 time in total.

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oula-khouzam

offline

Member

Joined: Tue, 31 Mar 2020 17:23
Posts: 12

Post subject: Re: Exercise 3.4

Posted: Fri, 03 Apr 2020 12:57

I like you proof Violeta!! and this is actually how I would think to prove it.
but I don't think that you have to include that x=0, since by the limit def. x can't be equal to x0 but close to it,
so we should only check it for f(x)=|x|/x

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helmut

online

Site Admin

Joined: Sat, 26 Apr 2003 15:14
Posts: 2234
Location: El Paso TX (USA)

Post subject: Re: 3.4

Posted: Sun, 05 Apr 2020 16:27

Correct, but: Have left (right) hand limits be defined in the notes? You can only use stuff in the notes before the one you are trying to proof.

Hint:
Suppose for all $\epsilon > 0$, you can find x and y in $(-\epsilon, \epsilon) \setminus \{0\}$ with $|f(x) - f(y)| > \epsilon$. Then you are done (why?)

The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark. - Michelangelo Buonarroti

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violeta guzman

offline

Math Cadet

Joined: Tue, 31 Mar 2020 15:36
Posts: 8

Post subject: Re: 3.4

Posted: Wed, 08 Apr 2020 15:14

Proof
Let ϵ=1, we can find x,y $(-\epsilon, \epsilon)$

$f(x) = \frac{|x|}{x} = \frac{|-1|}{-1} = \frac{1}{-1} = -1$, where $x \in (-\epsilon, 0)$

$f(y) = \frac{|y|}{y} = \frac{|+1|}{1} = \frac{1}{1} = 1$, where $y \in (0, \epsilon)$

There fore, according to exercise 3.3, f does not have a limit at $x_0 = 0$

$(\_\_\_\_\_ -\epsilon \_\_\_\_\_ x \_\_\_\_\_ 0 \_\_\_\_\_ y \_\_\_\_\_ \epsilon)$

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violeta guzman

offline

Math Cadet

Post subject: Re: 3.4

Posted: Wed, 08 Apr 2020 16:37

> **violeta guzman wrote:**

Joined: Tue, 31 Mar 2020 15:36
Posts: 8

Proof
Let ϵ=1, we can find x,y $(-\epsilon, \epsilon)$

$f(x) = \frac{|x|}{x} = \frac{|-1|}{-1} = \frac{1}{-1} = -1$, where $x \in (-\epsilon, 0)$

$f(y) = \frac{|y|}{y} = \frac{|+1|}{1} = \frac{1}{1} = 1$, where $y \in (0, \epsilon)$

$|f(x) - f(y)| = |-1-1| = 2 > \epsilon$

There fore, according to exercise 3.3, f does not have a limit at $x_0 = 0$

(_____$-\epsilon$_____x_____0_____y_____ϵ)

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Abigail Chaidez **Post subject:** Re: 3.4 **Posted:** Thu, 09 Apr 2020 18:14

offline

S.O.S. Newbie

Joined: Tue, 31 Mar 2020 14:55
Posts: 4

Why is it that you establish that epsilon is equal to 1?

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Jocelyne Perez **Post subject:** Re: 3.4 **Posted:** Thu, 09 Apr 2020 18:20

offline

Member

Joined: Tue, 31 Mar 2020 15:27
Posts: 10

> **Abigail Chaidez wrote:**
> Why is it that you establish that epsilon is equal to 1?

Could Epsilon be 1/2? or does it matter.

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violeta guzman **Post subject:** Re: 3.4 **Posted:** Thu, 09 Apr 2020 18:23

offline

Math Cadet

Joined: Tue, 31 Mar 2020 15:36
Posts: 8

> **Abigail Chaidez wrote:**
> Why is it that you establish that epsilon is equal to 1?

Abby, I read at the beginning of the chapter that " We say that the limit of $f(x)$ at x_0

is equal to $L \in \Re$, if for all ϵ>0....."
I was going off of things that we would do in class (setting $\epsilon = 1$). I guess you can set it as any epsilon if it works for all epsilon greater than 0.

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helmut **Post subject:** Re: 3.4 **Posted:** Mon, 13 Apr 2020 12:17

online

Site Admin

Joined: Sat, 26 Apr 2003 15:14
Posts: 2234
Location: El Paso TX (USA)

> **helmut wrote:**
>
> Hint:
> Suppose for all $\epsilon > 0$, you can find x and y in $(-\epsilon, \epsilon) \setminus \{0\}$ with $|f(x) - f(y)| > \epsilon$. Then you are done (why?)

I did not say that quite right. It needs to be:

Suppose there is an $\epsilon > 0$ such that for all $\delta > 0$, you can find x and y in $(-\delta, \delta) \setminus \{0\}$ with $|f(x) - f(y)| > \epsilon$. Then you are done (why?)

The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark. - Michelangelo Buonarroti

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helmut **Post subject:** Re: 3.4 **Posted:** Mon, 13 Apr 2020 12:19

online

Site Admin

Joined: Sat, 26 Apr 2003 15:14
Posts: 2234
Location: El Paso TX (USA)

But Violeta basically does that for $\epsilon = 1$, she chooses $x = \delta/2,\ y = -\delta/2$.

Done; Credit to Violeta.

The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark. - Michelangelo Buonarroti

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