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2.36

Moderator: helmut [Moderator Control Panel]

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Author	Message
oula-khouzam	**Post subject:** 2.36 **Posted:** Mon, 20 Apr 2020 01:58

offline

Member

Joined: Tue, 31 Mar 2020 17:23
Posts: 22

let S be an infinite bounded set of real and let $a \leq S \leq b$, a, b $\in \Re$
let a_1 be any point from [a,b], so a_1 will divide [a,b] into two intervals,
$[a, a_1]\ and\ [a_1, b]$,where one of them at least has infinite set of real number.
Take the one that has infinite set of real (let say it is $[a, a_1]$ and let a_2 be from that set.
This will also divide [a,a_1] into two intervals $[a, a_2]\ and\ [a_2, a_1]$ one of them at least has infinite set of real number.
choose the one that has infinite set of real and continue doing the same thing.......

we will always end up with an infinite set of real, let it be $[a_n, a_m] \subseteq [a, b]$
choose any $x \in [a_n, a_m]$
x in an accumulation point of the set S, since the neighborhood of x contains an element of S different from x.
so S has at least one accumulation point.

** I have feeling that there is something missing in this proof ↑ (though logically, I feel it is good), If you guys can see what is missing please let me know.

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helmut	**Post subject:** Re: 2.36 **Posted:** Mon, 20 Apr 2020 12:39

online

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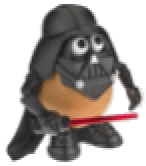
1. Are you assuming S is an interval?
2. What prevents me form picking $a = a_1 = a_2 \ldots$?
3. I think you are trying to prove this from scratch. It is easier to use the BW Theorem.



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: 2278
Location: El Paso TX (USA)

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oula-khouzam **Post subject:** Re: 2.36 **Posted:** Mon, 20 Apr 2020 12:57

offline
Member

so by using BW and 2.31 , this will be solved, right?

Joined: Tue, 31 Mar 2020 17:23
Posts: 22

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helmut **Post subject:** Re: 2.36 **Posted:** Mon, 20 Apr 2020 17:31

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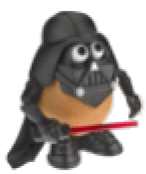
2.31 talks about "terms of the sequence".

So if $x_1 = x_2$, they are still 2 terms of the sequence, but only 1 element of the range of the sequence.



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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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anthony.d.dennis23 **Post subject:** Re: 2.36 **Posted:** Mon, 27 Apr 2020 16:34

offline
Member

I am confused by the term "Every" in the original question. If you choose an infinite set such as {1,1,1,...} it is bounded by any $\epsilon > 0$ but by Task 3.2 it can't have an accumulation point at 1 because 1 is not different than any element of the set. It also does not have an accumulation point at any other real number because there will be no elements of the set except 1 in the $\epsilon - neighborhood$ of 1.

So then what Oula has initially written is true for some infinite bounded sets.

> **oula-khouzam wrote:**
>
> we will always end up with an infinite set of real, let it be $[a_n, a_m] \subseteq [a, b]$
> choose any $x \in [a_n, a_m]$
> x in an accumulation point of the set S, since the neighborhood of x contains an element of S different from x.
> so S has at least one accumulation point.

Joined: Sat, 28 Mar 2020 15:16
Posts: 25

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oula-khouzam

offline

Member

Joined: Tue, 31 Mar 2020 17:23
Posts: 22

Post subject: Re: 2.36 **Posted:** Thu, 30 Apr 2020 00:03

Hi Anthony,
to answer your question about the set {1, 1, 1,...}: since it is a set, we are not allowed to have the same element more than one time it should be written as {1}.

From 2-19:
"The Completeness Axiom is equivalent to the following: Every non-empty set of real numbers which is bounded from above has a supremum."

that means, this set has a supremum (say x) , (and infimum since it is bounded, but we don't really need this here)

for all ϵ >0 we can find $a \in (x-\epsilon, x)$ such that a is in the set.
so x is an accumulation point for the set.

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anthony.d.dennis23

offline

Member

Joined: Sat, 28 Mar 2020 15:16
Posts: 25

Post subject: Re: 2.36 **Posted:** Thu, 30 Apr 2020 13:34

Oula,

I see the flaw in my thought process. Thanks.

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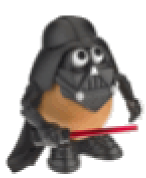

Joined: Sat, 26 Apr 2003 15:14
Posts: 2278
Location: El Paso TX (USA)

Post subject: Re: 2.36 **Posted:** Thu, 07 May 2020 14:14

1/2 credit for Oula.

Here is a short proof using the BW:
Let X be an infinite bounded set. Since X is infinite, we can recursively choose a sequence (x_n) of elements in X satisfying $x_n \neq x_m$ for all $n \neq m$. (Check the details!)

Since X is bounded, the sequence (x_n) is bounded and thus has a converging subsequence. By 2.35 the limit of this subsequence is an accumulation point of X .

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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