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2.25

Moderator: helmut [Moderator Control Panel]

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Author	Message
vperch5	**Post subject:** 2.25 **Posted:** Sun, 05 Apr 2020 20:18

offline

S.O.S. Newbie

Joined: Sat, 28 Mar 2020 01:10
Posts: 1
Location: Texas

This is how (in my mind) I saw the problem after receiving guidance from our professor.

Given: The sequence (a_n) does not converge to the real number L.
That is: ∃ϵ>0 ∀N∈ℵ ∃n≥N : |a_n-L|≥ ϵ ∀n∈ℵ

Proof:
Starting with (a_n), we will now look at different cases.

For N_1=1 ∃n≥1 and that n is; k_1=n: |a_{k_1}-L|≥ϵ ∀n,k

For N_2=k_1+1 ∃n≥k_1+1 and that n is; k_2=n+1: |a_{k_2}-L|≥ ϵ ∀n,k

We know that (a_{n_k}) is a subsequence of (a_n) if ψ(k)=n_k ∀k∈ℵ

Now we will take a look at cases for the subsequence a_{n_k}

For N_1=1 ∃n_k≥1 and that n_k is; $\psi(k_1)$=n_{k1}: |$a_{n_{k_1}}$-L|≥ ϵ ∀n,k

For N_2=$\psi(k_1)$+1 ∃n_k≥$\psi(k_1)$ and that n_k is; $\psi(k_1+1)$=n_{k2}: |$a_{n_{k_2}}$-L|≥ϵ ∀n,k

If we continue in this fashion, with k_{n+1}≥k_n ∀k∈ℵ; we can always find an ϵ>0, for ∀N∈ℵ, ∀n_k ≥N such that: |a_{n_k}-L|≥ ϵ∀k

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helmut **Post subject:** Re: 2.25 **Posted:** Tue, 07 Apr 2020 14:06

online

Site Admin

Joined: Sat, 26 Apr 2003 15:14
Posts: 2223
Location: El Paso TX (USA)

> **vperch5 wrote:**
>
> Given: The sequence (a_n) does not converge to the real number L.
> That is: $\exists\epsilon>0\ \forall N\in\mathbb{N}\ \exists n\geq N : |a_n-L|\geq \epsilon\ \forall n\in\mathbb{N}$
>
> Proof:
> Starting with (a_n), we will now look at different cases.
>
> For $N_1=1$ $\exists n\geq 1$ and if we let this n be k_1: $|a_{k_1}-L|\geq\epsilon$
>
> For $N_2=k_1+1$ $\exists n>k_1$ and if we set this n to k_2: $|a_{k_2}-L|\geq \epsilon$. Note that $k_2 > k_1$.
>
> For $N_3=k_2+1$ $\exists n>k_2$ and if we set this n to k_3: $|a_{k_3}-L|\geq \epsilon$
>
> If we continue in this fashion, we obtain the desired subsequence $\left(a_{n_k}\right)$ satisfying $\left|a_{n_k} - L\right| \geq \epsilon$

I made a few minor changes. Use \mathbb{N} for a "blackboard" N.

1 Credit to Vivian!

____

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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