4.6

Author	Message

Abigail Chaidez

offline

Member

Joined: Tue, 31 Mar 2020 14:55
Posts: 21

Post subject: 4.6 **Posted:** Thu, 07 May 2020 21:26

As we already know from 1.11 that for every two rational number is an irrational number in between
This means that for every x_0 value the values will fluctuate between 0 and 1 at every number in $\Re$
Hence there is no value of x_0 where $f(x)$ continuous at interval $(0, 1] \to \Re$
Therefore $f(x)$ is discontinuous everywhere in $\Re$.

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Jocelyne Perez

offline

Member

Joined: Tue, 31 Mar 2020 15:27
Posts: 23

Post subject: Re: 4.6 **Posted:** Thu, 07 May 2020 22:31

> **Abigail Chaidez wrote:**
>
> As we already know from 1.11 that for every two rational number is an irrational number in between
> This means that for every x_0 value the values will fluctuate between 0 and 1 at every number in $\Re$
> Hence there is no value of x_0 where $f(x)$ continuous at interval $(0, 1] \to \Re$
> Therefore $f(x)$ is discontinuous everywhere in $\Re$.

Then do we assume its continuous and solve for 2 cases ?
Case 1
So you are saying if x_0 is rational, then $f(x_0) = 1$
Also, $\exists\, y_0$ in $x_0 - \delta < x < x_0 + \delta$
s.t y_0 is irrational, $\Rightarrow f(y_0) = 0 \Rightarrow |\ 1 - 0\ | < \frac{1}{2}$ assuming $\varepsilon = \frac{1}{2}$

It is not possible so it is not continuous on rational numbers.
Case 2
Similarly if x_0 is irrational, then $f(x_0) = 0$
Also $\exists$ some y_0 in $x_0 - \delta < x < x_0 + \delta$
s.t rational, $\Rightarrow f(y_0) = 1$
$\Rightarrow |\ 1 - 0\ | < \frac{1}{2}$ again assuming $\varepsilon = \frac{1}{2}$
It is not possible either Therefore, it is not continous on irrational numbers.
Hence the function is nowhere continuous

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Abigail Chaidez | **Post subject:** Re: 4.6 | **Posted:** Thu, 07 May 2020 22:49

offline
Member
Joined: Tue, 31 Mar 2020 14:55
Posts: 21

> **Quote:**
> Then do we assume its continuous and solve for 2 cases ?
> Case 1
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> It is not possible so it is not continuous on rational numbers.
> Case 2
> Similarly if x_0 is irrational, then $f(x_0) = 0$
> Also $\exists$ some y_0 in $x_0 - \delta < x < x_0 + \delta$
> s.t rational, $\Rightarrow f(y_0) = 1$
> $\Rightarrow |\ 1 - 0\ | < \frac{1}{2}$ again assuming $\varepsilon = \frac{1}{2}$
> It is not possible either Therefore, it is not continous on irrational numbers.
> Hence the function is nowhere continuous

Hi Jocelyne,
Yes the way you proved it is the way I explained it in words I just didn't know how to put the prove together. I do see a typo in the irrational portion though.
$|\ 0 - 1\ | < \frac{1}{2}$ assuming $\varepsilon = \frac{1}{2}$
Because it should look like this $|\ x - x_0\ | < \epsilon$
Overall I think your prove it correct.

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Jocelyne Perez | **Post subject:** Re: 4.6 | **Posted:** Thu, 07 May 2020 23:59

offline
Member
Joined: Tue, 31 Mar 2020 15:27
Posts: 23

Lets see if these changes help.

Take $\varepsilon = \frac{1}{2} > 0$
Let us assume that the given function is continuous. Thus means, $\exists \delta > 0$
s.t $|\ f(x_0) - f(x)\ | < \frac{1}{2}$ whenever $|\ x - x_0\ | < \delta$

Then we solve for 2 Cases
Case 1
So you are saying if x_0 is rational, then $f(x_0) = 1$
Also, $\exists\, y_0$ in $x_0 - \delta < x < x_0 + \delta$
s.t y_0 is irrational, $\Rightarrow f(y_0) = 0 \Rightarrow | \ 0 - 1 \ | < \frac{1}{2}$ assuming $\varepsilon = \frac{1}{2}$
It is not possible so it is not continuous on rational numbers.
Case 2
Similarly if x_0 is irrational, then $f(x_0) = 0$
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$\Rightarrow | \ 1 - 0 \ | < \frac{1}{2}$ again assuming $\varepsilon = \frac{1}{2}$
It is not possible either Therefore, it is not continous on irrational numbers.
Hence the function is nowhere continuous[/quote]

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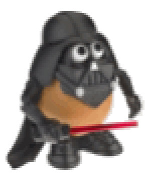

Joined: Sat, 26 Apr 2003 15:14
Posts: 2286
Location: El Paso TX (USA)

Post subject: Re: 4.6 **Posted:** Fri, 08 May 2020 12:24

Correct. 1 credit to Jocelyne.

Alternatively, one could have used 3.6 and 4.1.

____
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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