

Re: f continuous on  $[a,b]$  and differentiable on  $(a,b)$ –

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*Source:* <http://sci.tech-archive.net/Archive/sci.math/2006-01/msg00709.html>

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- *From:* JEMebius <[jemebius@xxxxxxxxxx](mailto:jemebius@xxxxxxxxxx)>
  - *Date:* Fri, 06 Jan 2006 16:52:50 +0100
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deniz.bahar@xxxxxxxxxx wrote:

Why do many theorems in calculus/analysis have the hypotheses, f continuous on  $[a,b]$  and differentiable on  $(a,b)$ ?

My question is really why the endpoints are not included for the differentiable hypothesis. Aren't functions that are continuous on  $[a,b]$  and differentiable on  $(a,b)$  also differentiable from one side at the endpoints?

I guess you are thinking of the Mean Value Theorem and of Rolle's Theorem in calculus.

(See <http://mathworld.wolfram.com/Mean-ValueTheorem.html> and <http://mathworld.wolfram.com/RollesTheorem.html> )

To answer your question "why only continuity at the endpoints?": it is just about having desirable properties and results under the most general preconditions.

On the bottom of web page

[http://www.maths.tcd.ie/pub/HistMath/People/17thCentury/RouseBall/RB\\_Math17C.htm](http://www.maths.tcd.ie/pub/HistMath/People/17thCentury/RouseBall/RB_Math17C.htm)

there is some information on Michel Rolle. I guess that Rolle actually tried to debunk the at that time recently developed differential calculus by all ways and means. It is quite well possible that he specifically researched the relation between differences and differentials - this is what in essence the Mean Value Theorem is about.

And when one is looking for fallacies and loopholes, one analyses what is true under the most specific preconditions, what is true under the most general preconditions, and all variations in-between.

BTW, I am curious about other theorems in calculus which exhibit the

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Re:  $f$  continuous on  $[a,b]$  and differentiable on  $(a,b)$ –  
hypotheses of continuity on  $[a,b]$  and differentiability on  $(a,b)$ .

Happy and prosperous New Year: Johan E. Mebius