Re: Proof of Dirichlet's Test for convergence of given integral

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- *From*: Timothy Murphy <tim@xxxxxxxxxxxxxxxxxxxxxx>

- *Date*: Fri, 08 Jun 2007 00:52:28 +0100

precarion wrote:

> Wow... Your proof is fantastic! I was thinking about Riemann Integrals,
> but you have provided the proof that can be used for Lebesgue Integrals as
> well. There is only one problem... I need a proof that can be easily
> explained to the studens of the 1st year of mathematics... On my
> university the measure theory is on the 2nd year of studies, so I believe
> that your proof unfortunately (I really like it!) will be too hard for
> them to understand.
>
> Do you possibly know any proof of Dirichlet's Test for convergence of
> integrals that is using only Riemann Integrals? (I've already found one in
> Fichtenholtz's calculus book, but it's too boring in my opinion, and I'm
> still looking for something else...)

I would have thought the simplest way would be to first prove
the corresponding result for series sum a_n b_n ,
which is well−known and useful in many cases
(eg in studying the convergence of Dirichlet series sum a_n n^{−s}).

If in fact the integrals involved were all Riemann integrals
then the series result would extend at once to the integral result,
using the usual approximation to the integrals by sums.

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