

## Re: directional derivative,--

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- *From:* JEMebius <jemebius@xxxxxxxxxx>
  - *Date:* Tue, 24 Apr 2007 14:53:06 +0100
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David C. Ullrich wrote:

On Tue, 24 Apr 2007 01:43:40 +0100, JEMebius <jemebius@xxxxxxxxxx> wrote:

What about the well-known rectangular circular half-cone, the graph of  $(x, y) \rightarrow z = \sqrt{x^2 + y^2}$ ?

That has no directional derivative in *any* (non-zero) direction (at the origin, which is presumably the point you're talking about.)

At least not according to what I've always thought was the standard definition, as at

[http://en.wikipedia.org/wiki/Directional\\_derivative](http://en.wikipedia.org/wiki/Directional_derivative)

That is absolutely correct, if it is indeed standard to consider only entire lines through the point in question. Is it standard in university and college math curricula? – I don't know.

When defining mathematical concepts I want to stay as closely as possible to everyday physical reality. So I identified "direction" with "half-line" rather than with "line".

In my opinion it is partly a matter of convention, partly a matter of to what degree one wants to change the common meaning of an everyday word into a precise mathematical meaning, and partly a matter of convenience whether one considers half-lines or entire lines through the point in question.

Johan E. Mebius

At first sight the problem seems underspecified? incompletely posed? badly posed? provocative, i.e. aimed at putting in motion the reader's creativity?

Re: directional derivative,--

Or did the author mean to ask:

"Prove that no real-valued function  $f$  that has a continuous derivative at a point  $C$  has a positive directional derivative at  $C$  for every possible direction  $u$ ."

BTW, the paraboloid  $(x, y) \rightarrow z = x^2 + y^2$  does not qualify because the slope at  $(0, 0)$  is zero in every direction.

This example shows that zero local slope is not in contradiction to positive average slope.

Ciao: Johan E. Mebius

chrizm7@xxxxxxxx wrote:

A problem asks me to show that no real-valued function  $f$  has a positive directional derivative at a fixed point  $c$  for every possible