Re: directional derivative,−

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- *From*: David C. Ullrich <ullrich@xxxxxxxxxxxxxxxx>
- *Date*: Tue, 24 Apr 2007 06:54:36 −0500

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

> What about the well−known rectangular circular half−cone,
> the graph of (x, y) −> 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

> At first sight the problem seems underspecified? incompletely posed? badly posed?
> provocative, i.e. aimed at putting in motion the reader's creativity?
>
> 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) −> 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@xxxxxxxxx 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
>> direction u.
>>
>> But wouldn't a paraboloid work? Fix c corresponding to the vertex.
>> Then for any direction u, the slope will always be positive

(increasing).

To be clear, the exact problem is worded: Prove that there is no real−valued function f such that f'(c;u) > 0 for a fixed point c in R^n and every nonzero vector u in R^n.

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David C. Ullrich
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