

## Re: a polynomial with positive real roots

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Date: 11 Jan 2005 04:21:21 -0800

David C. Ullrich wrote:

> On 10 Jan 2005 12:00:38 -0800, "Amanda" <[sca18@hotmail.com](mailto:sca18@hotmail.com)> wrote:

>

>>

>> david petry wrote:

>>> Amanda wrote:

>>>

>>> > Dealing with an algorithm, I came across the following problem:

>>> >

>>> > I have a polynomial  $P$  of degree  $>1$  and real coefficients. I know

>>> > that,

>>> > if  $z$  is a root of  $P$ , then  $\operatorname{Re}(z) \geq 0$ . It follows that, if  $r$  is a  
real

>>> > root of  $P'$ , then  $r \geq 0$ .

>>> >

>>> > I can affirm this because all roots of  $P$  lie in the closed half  
>>> > plane

>>> > to the right of the imaginary axis. According to Lucas' theorem,  
it

>>> > follows all the roots of  $P'$  lie in this same half plane, which

>>> > implies

>>> > that, if  $r$  is a real root of  $P'$ , then  $r \geq 0$ .

>>> > This conclusion is correct, isn't it?

>>>

>>> The conclusion is correct, though I'm not sure what Lucas' Theorem

>>> is. The roots of  $P'$  lie in the convex hull of the roots of  $P$ .

>>

>> Lucas' theorem says that, if all roots of  $P$  are in a same open half

>> plane of the complex plane, then the roots of  $P'$  are in this same  
half

>> plane. I think Lucas' theorem implies the roots of  $P'$  lie in the  
convex

>> hull of the roots of  $P$ .

>

> Yes, that's equivalent, because a convex set is an intersection  
> of half-planes.

>

sci.math: Re: a polynomial with positive real roots

Lucas's theorem deals only with open half planes, right? That is, it's proof assumes the roots of  $P$  are in an open half plane, isn't it?  
Amanda