Re: (Discrete Math − Induction) 'Formula Differentiation'

Source: http://sci.tech−archive.net/Archive/sci.math/2008−03/msg04303.html

- *From*: Ray Vickson <RGVickson@xxxxxxx>

- *Date*: Mon, 31 Mar 2008 00:24:40 −0700 (PDT)

On Mar 30, 10:03 pm, "almeidabati...@xxxxxxx"
<almeidabati...@xxxxxxxxx> wrote:

> On 31 mar, 02:05, quasi <qu...@xxxxxxxx> wrote:
>
> > On Sun, 30 Mar 2008 20:48:11 −0700 (PDT), "almeidabati...@xxxxxxx"
> >
> > <almeidabati...@xxxxxxxxx> wrote:
> >
> > > On 30 mar, 23:45, quasi <qu...@xxxxxxxx> wrote:
> > >
> > > > On Sun, 30 Mar 2008 18:30:51 −0700
> > > > (PDT), "almeidabati...@xxxxxxx"
> > > >
> > > > <almeidabati...@xxxxxxxxx> wrote:
> > > >
> > > > > Hi all! I've got this problem
> > > > > in my set:
> > > >
> > > > > '1 + 2q + 3q^2 + ... +
> > > > > nq^(n−1) = [1 − (n+1)q^n +
> > > > > nq^(n−1)]/[(1 −
> > > > > q)^2], q <> 1.
> > > >
> > > > > Estabilish [the formula
> > > > > above] by differentiating the
> > > > > expansion of the

formula for the sum of a
geometric progression.'

I've been thinkering with
this one all day, no clue on
how to start.
ANY hints on how the
derivative of the sum of
terms of a G.P will get
into this are welcome.

(1) Find an antiderivative of the LHS.

(2) Look at the result −− do you recognize
it?

(3) Based on the answer to (2), use a known
formula to simplify the
result.

(4) Now differentiate the simplified result,

quasi

Hmmmmmm! This algebric trick would never happen to me
wouldn't it be
your answer! Thanks a lot!

Just to be sure, the only 'induction' involved in the solution is
finding the derivative of the summation?

Unless you're required to be ultra−formal, there's no need for
induction. Just show the pattern, making clear that it works, term by

> term. If you want, you can also show explicitly what happens to the
> k'th term, where k is an arbitrary index variable, left undetermined.
>
> quasi
>
> I guess there's no such need, the doubt just arised on me because this
> problem is from the Mathematical Induction chapter of my Discrete
> Mathematics book. Thanks for the answer.

I suppose whether or not you need induction depends on what you are assumed to know already and are allowed to use. For instance, the derivative of a sum is the sum of the derivatives. One way to show this is by induction, showing it first for two summands. Also, you need the formula for the sum of a geometric series. One way to obtain it is through induction, although there are much better ways of ding it. You need to know that the derivative of x^n is n*x^(n−1). One say to obtain this is through induction and the rule about the derivative of a product of two functions. Are all these things known? Then you don't need induction.

R.G. Vickson
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