Subject: Re: Transforming a nonlinear equation Posted by Paolo Grigis on Tue, 07 Aug 2007 16:12:30 GMT

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wlandsman wrote:
```

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The following task probably can't be done with IDL, but maybe some IDL
users can point me in the right direction.
I have a nonlinear equation in x, e.g.
```

```
> (1) y = 3.2 + 1.2*x + 3.1*x^2 - 4.2*x^3
```

> and I have a linear transformation in x: x' = 1.2*x + 0.4

- > so I want to find the new coefficients of equation (1) under the
- > transformation. If I were to do this with pencil and paper, I
- > would put the transformation equation into (1), and collect all the
- > cubic terms, quadratic terms etc. to find the new coefficients.

>

- > I presume (but am not certain) that this is something that is very
- > simple to do with Mathematica or Maple. But right now I only
- > need it for a couple of equations so I'd prefer not to have to learn
- > Mathematica (or do it by hand). Thanks, --Wayne

>

This should be feasible using the binomial expansion formula

```
(a+b)^n = sum_i^n binomial(i,n) * a^i * b^(n-i)
```

If the original polynomial is given by an array a with the coefficients index equal its order, and x=alpha*y+beta is the linear transformation, then the following code should deliver the new coefficients of the y-polynomial:

```
degree=n_elements(a)-1

newarray=a*0
```

FOR i=0,degree DO BEGIN

FOR j=0,i DO BEGIN

newarray[j]=newarray[j]+a[i]*binomial(j,i)*alpha^j*beta^(i-j)

ENDFOR

ENDFOR

where the binomial(j,n) function returns factorial(n)/(factorial(j)*factorial(n-j))

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