Subject: Re: complex arithmetic
Posted by salchegg on Wed, 06 Apr 1994 14:36:08 GMT
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I tried

```
IDL> z = complex(0.0,1.0)
IDL> print,exp(alog(z)/3)
(    0.866025,    0.500000)
IDL>
```

This is correct $z^{1/3} = e^{\ln(z)/3}$ but unfortunately incomplete.

Because:

Let n be an integer and z a complex number then
$z^{1/n}$ has n solutions in the complex plane (de Moivre !!)

This would mean that IDL should have to make a new array with the solutions:
v = exp(alog(z)/3). This does not happen.
Out of v(0),..,v(n-1) only v(0) is computed.

On the other hand the original question in the first posting told us about problems with the more general problem:

Let u,v be complex numbers.

If we want to compute $z = u^v = \exp(v \, Ln(u))$, we have to handle the problem with the complex logarithm (Ln):

$Ln(u) = \ln |z| + i (\varphi_0 + 2k\pi)$ with k = {0,+/- 1, +/- 2, ...}

and $-\pi < \varphi_0 \le \pi$

BUT: IDL's alog(z) only computes one value.

```
IDL> z = complex(0.,1.)
IDL> print, exp(alog(z)/3.0)
(    0.866025,    0.500000)
IDL> v = z
IDL> print, exp(v*alog(z))
(    0.207880,    0.00000)     which is   $i^i = e^{-\pi/2}$
IDL>
```


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