

## [6.7] Complex derivatives

The 89/92+ can find derivatives of functions in complex variables as well as those in real variables. Make sure that you specify that the variables are complex using the underscore character "\_".

For example

$$d(1/(1-z_), z_)$$

returns

$$\frac{1}{(z_- - 1)^2}$$

To put the result in terms of the real and imaginary components, use

$$d(f(z_), z_) | z_ = a + bi$$

where 'i' is the complex unit operator. So,

$$d(1/z_, z_) | z_ = a + bi$$

returns

$$\frac{-(a^2 + b^2)}{(a^2 + b^2)^2} + \frac{2 \cdot a \cdot b}{(a^2 + b^2)^2} i$$

If you fail to specify the variables as complex, you may not get the answer you expect. For example, the derivative of the complex conjugate function *conj()* is undefined, yet

$$d(\text{conj}(z), z) | z = a + bi$$

returns 1, which is *not* correct for complex *z*. This result comes about because the CAS assumes that *z* is a real variable, performs the differentiation, then substitutes *a+bi*.

Even though the rules for complex differentiation are the same as those for real differentiation, the criteria for complex differentiability are more stringent.