= ln (b) is the unique real solution to the equation ex =
b . So the same method working for real exponents also works for complex exponents .
For example :
<formula>
<formula>
<formula>
The identity (bz) u = bzu is not generally valid for complex powers . The power bz is a complex number and any power of it has to follow the rules for powers of complex numbers below . A simple counterexample is given by :
<formula>
The identity is , however , valid for arbitrary complex <formula> when <formula> is an integer .

= = Powers of complex numbers = =

Integer powers of nonzero complex numbers are defined by repeated multiplication or division as above . If i is the imaginary unit and n is an integer , then in equals 1 , i , ? 1 , or ? i , according to whether the integer n is congruent to 0 , 1 , 2 , or 3 modulo 4 . Because of this , the powers of i are useful for expressing sequences of period 4 .
Complex powers of positive reals are defined via ex as in section Complex exponents with positive real bases above . These are continuous functions .
Trying to extend these functions to the general case of noninteger powers of complex numbers that are not positive reals leads to difficulties . Either we define discontinuous functions or multivalued functions . Neither of these options is entirely satisfactory .