

$= 1/n$  and  $n$  is a positive integer. These are the  $n$ th roots of  $w$ ; they are solutions of the equation  $z^n =$

$w$ . As with real roots, a second root is also called a square root and a third root is also called a cube root.

It is conventional in mathematics to define  $w^{1/n}$  as the principal value of the root. If  $w$  is a positive real number, it is also conventional to select a positive real number as the principal value of the root  $w^{1/n}$ . For general complex numbers, the  $n$ th root with the smallest argument is often selected as the principal value of the  $n$ th root operation, as with principal values of roots of unity.

The set of  $n$ th roots of a complex number  $w$  is obtained by multiplying the principal value  $w^{1/n}$  by each of the  $n$ th roots of unity. For example, the fourth roots of 16 are 2,  $\sqrt{2}$ ,  $2i$ , and  $\sqrt{2}i$ , because the principal value of the fourth root of 16 is 2 and the fourth roots of unity are 1,  $\sqrt{2}$ ,  $i$ , and  $\sqrt{2}i$ .

== Computing complex powers ==

It is often easier to compute complex powers by writing the number to be exponentiated in polar form. Every complex number  $z$  can be written in the polar form  
<formula>