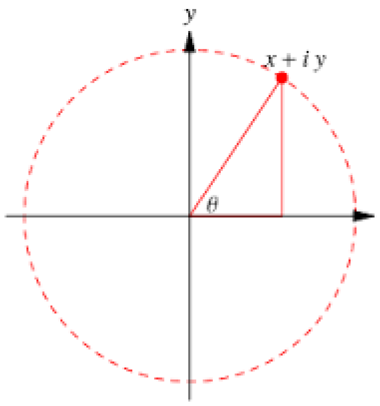
Complex Number



A **complex number (z)** is a number that can be expressed in the form x+iy, where x and y are real numbers and i is the imaginary unit.

$i = \sqrt{-1}$

That is,

x = Re(z) (Re=Real)

y = Im(z) (Im = Imaginary)

$$\mathrm{Re}(z) + \mathrm{Im}(z).\mathrm{i}$$

A real number *a* can be regarded as a complex number *a* + 0*i* whose imaginary part is 0. A purely imaginary number *bi* is a complex number 0 + *bi* whose real part is zero. It is common to write *a* for *a* + 0*i* and *bi* for 0 + *bi*.

Moreover, when the imaginary part is negative, it is common to write *a* − *bi* with *b* > 0 instead of *a* + (−*b*)*i*, for example 3 − 4*i* instead of 3 + (−4)*i*.

Lets take a complex number (z) 4+3i. Plot it in the x-y axis. Then multiply it with 'i' & plot the result. (w is (-3, 4). Continue it with two more times & plot the points. Now you can see, the four points lies in four different quartinates.

The first & the third and the second & the fourth are equal in magnitude & opposite in direction. This shows 1^{st} & 2^{nd} , 2^{nd} & 3^{rd}, 3^{rd} & 4^{th} are 90 degree apart.

Thus a complex number (i) can capable of seperate two same signals, 90 degree apart if multipying one with 'i'.

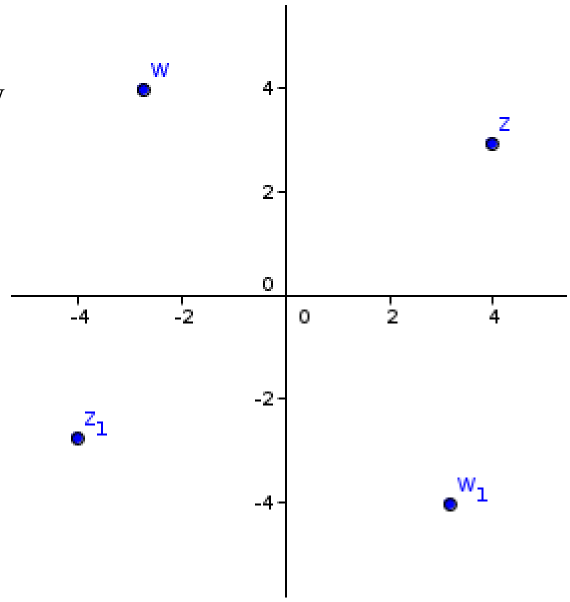


Figure 1.1