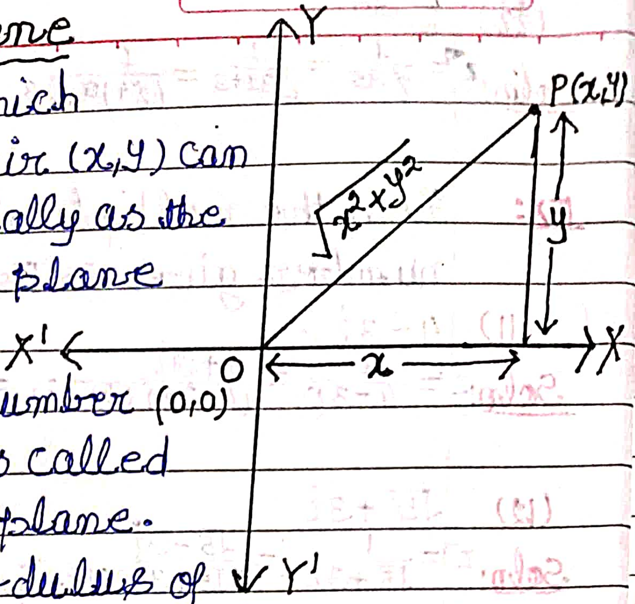
Complex Plane or Argand Plane



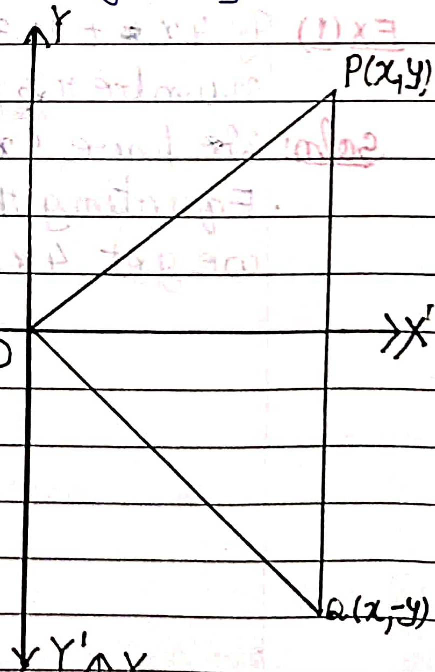
The complex number $x+iy$ which corresponds to the ordered pair (x,y) can be represented by geometrically as the unique point $P(x,y)$ in the XY-plane and vice-versa.

The plane having a complex number $(0,0)$ assigned to each of its point is called the complex plane or Argand plane.

In the Argand plane, the modulus of the complex number $x+iy$ is $\sqrt{x^2+y^2}$ is the distance between the point $P(x,y)$ and the origin $O(0,0)$.

The points on the x-axis corresponds to the complex numbers of the form $a+i0$ and the points on the y-axis corresponds to the complex numbers of the form $0+ib$. The x-axis and y-axis in the Argand plane are called, respectively, the real and the imaginary axes.

The representation of a complex number $z=x+iy$ and its conjugate $\bar{z}=x-iy$ in the Argand plane are, respectively, the points $P(x,y)$ and $Q(x,-y)$. Geometrically, the point $(x,-y)$ is the mirror image of the point (x,y) on the real axis.

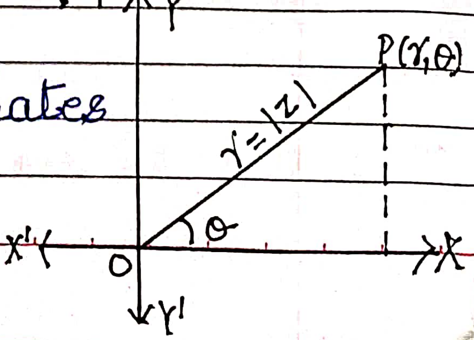


Polar form of a complex number:

Let the complex number $z=x+iy$ be represented by the point $P(x,y)$ in the complex plane.

Let $\angle XOP=\theta$ and $|OP|=r>0$. Then, $P(r,\theta)$ are called the polar coordinates of P. We call the origin O as Pole.

Clearly, $x=r\cos\theta$, $y=r\sin\theta$ (1)



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$\therefore z = r(\cos\theta + i\sin\theta)$

This is called the polar form or trigonometric form or modulus-amplitude form of z.

The positive direction of the x-axis i.e., OX is called as the initial line.

Here, $r = \sqrt{x^2+y^2} = |z|$ is called the modulus of z, and θ is called the argument or amplitude of z which is denoted by arg(z) or amp(z).

The value of θ such that $-\pi < \theta \leq \theta$ is called the principal argument of z.