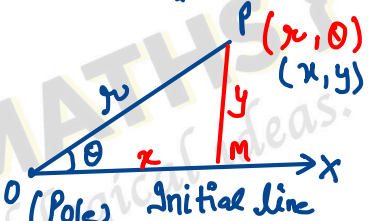
Relation between Polar and Cartesian co-ordinates

$$\sin\theta = \frac{y}{r}$$

$$y = r\sin\theta$$

$$\cos\theta = \frac{x}{r}$$

$$x = r\cos\theta$$



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$x = r\cos\theta$ — (I)

$y = r\sin\theta$ — (II)

By squaring and adding (I) & (II)

$x^2 + y^2 = r^2(\sin^2\theta + \cos^2\theta)$

$x^2 + y^2 = r^2$

$r = \sqrt{x^2 + y^2}$

$\tan\theta = \frac{y}{x} \Rightarrow \theta = \tan^{-1}\left(\frac{y}{x}\right)$

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Modulus of Complex No. $x+iy$

$$Z = |x+iy| = \sqrt{x^2+y^2}$$

Amplitude of Complex No. $= r.$

$\theta = amp(x+iy)$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$ } different

$Z = -2+2i$

Compare with $r(\cos\theta + i\sin\theta)$

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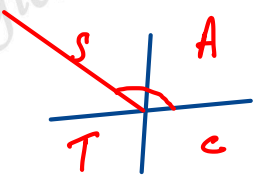
$r\cos\theta = -2$

$r\sin\theta = 2$

Squaring and adding

$r^2 = 8$

$r = 2\sqrt{2}$



$\cos\theta = \frac{-2}{2\sqrt{2}} = \frac{-1}{\sqrt{2}}$

$\sin\theta = \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}} \Rightarrow \theta = 3\pi/4$

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Principle value

$$\theta = \tan^{-1}\frac{y}{x} = \tan^{-1}\left(\frac{2}{-2}\right)$$

$$= \tan^{-1}(-1)$$

$$\theta = \frac{-\pi}{4}.$$

$$\text{Cis}\theta = \cos\theta + i\sin\theta.$$

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