$\sqrt{3}+i$ polar form

$z = x+iy = \sqrt{3}+i$

$\therefore x = \sqrt{3}, y = 1$

$\alpha = \tan^{-1}\left|\frac{y}{x}\right| = \tan^{-1}\left|\frac{1}{\sqrt{3}}\right| = \pi/6$

Here $z = (\sqrt{3}, 1)$ $(+,+)$ is in 1st quadrant

$\text{amp } z = \alpha = \pi/6$

$\theta = \pi/6$

$|z| = \sqrt{x^2+y^2} = \sqrt{(\sqrt{3})^2+1^2} = \sqrt{4} = 2$ modulus

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

$\boxed{\sqrt{3}+i = 2\left(\cos\left[\pi/6\right] + i\sin\left[\pi/6\right]\right)}$

modulus & amplitude

$1-\cos\alpha+i\sin\alpha$

$= 2\sin^2\left[\alpha/2\right] + i\,2\sin\left[\alpha/2\right]\cos\left[\alpha/2\right]$

$= 2\sin\left[\alpha/2\right]\left[\sin\left[\alpha/2\right] + i\cos\left[\alpha/2\right]\right]$

$\therefore z = 2\sin\left[\alpha/2\right]\left[\cos\left[\frac{\pi}{2} - \alpha/2\right] + i\sin\left[\pi/2 - \alpha/2\right]\right]$

$\because \sin\&\cos$ & $\sin$ $+ve$ in 1st quadrant

$|z| = 2\sin\left[\alpha/2\right]$ & $\text{amp } z = \pi/2 - \alpha/2$