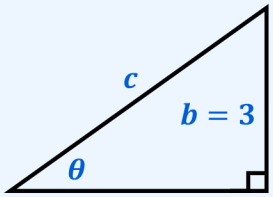
TOPIC: POLAR FORM OF COMPLEX NUMBERS

Complex Numbers in Polar Form

◆ Complex #'s can also be written in **polar form** with r (_____ from origin) & θ (_____ w/ real axis).

EXAMPLE Write the complex number $4 + 3i$ in polar form.

Recall **Solving Right Triangles**



$$\sin\theta = \frac{b}{c} \qquad \cos\theta = \frac{a}{c} \qquad \tan\theta = \frac{b}{a}$$

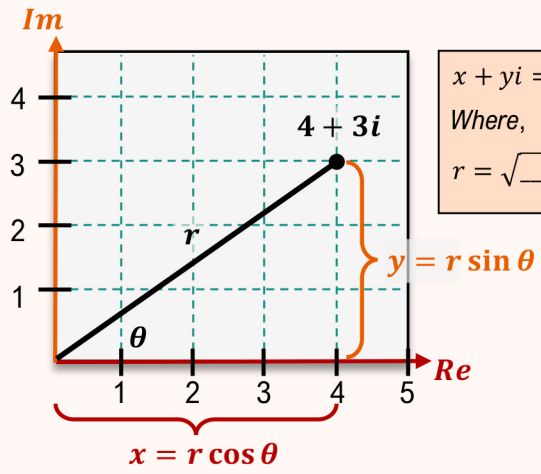
$c = \sqrt{4^2 + 3^2}$

$c = 5$

$\theta = \tan^{-1}\left(\frac{3}{4}\right)$

$\theta = 37°$

New **Complex Numbers in Polar Form**



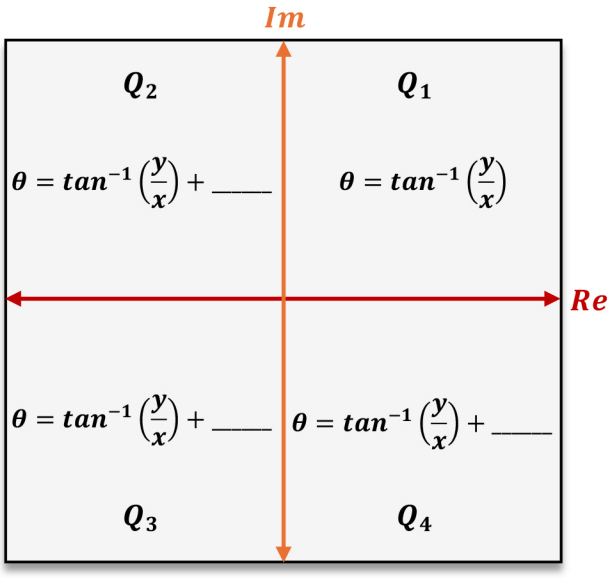
$x + yi = \_ \cdot (\_\_\_\_\_ + i \cdot \_\_\_\_\_)$

Where,

$r = \sqrt{\_\_^2 + \_\_^2}$ $\tan\theta^* = \_\_\_\_$ **Degrees*

$4 + 3i =$

◆ When calculating θ you may need to adjust the value based on the _____.



TOPIC: POLAR FORM OF COMPLEX NUMBERS

PRACTICE Express the complex number $z = 7 + 11i$ in polar form.

PRACTICE Express the complex number $z = 2 - 4i$ in polar form.

PRACTICE Express the complex number $z = 1 - \frac{\sqrt{3}}{3}i$ in polar form.

TOPIC: POLAR FORM OF COMPLEX NUMBERS

Converting Complex Numbers from Polar to Rectangular Form

◆ To convert complex numbers back to rectangular form, just _____ r.

Recall

$x + yi = r(\cos\theta + i \cdot \sin\theta)$

(Rect. Form) (Polar Form)

EXAMPLE Convert the complex number from polar to rectangular form. Identify x & y.

New **Complex #'s: Polar → Rect. Form**

$z = 5(\cos 37° + i \cdot \sin 37°)$

$x =$ ___ $y =$ ___

EXAMPLE Convert the complex number from polar to rectangular form.

$8\left(\cos\frac{\pi}{6} - i \cdot \sin\frac{\pi}{6}\right)$

TOPIC: POLAR FORM OF COMPLEX NUMBERS

PRACTICE Convert the complex number $z = 12(\cos 90° + i \cdot \sin 90°)$ from polar to rectangular form.

PRACTICE Convert the complex number $z = \sqrt{2}(\cos \frac{7\pi}{4} + i \cdot \sin \frac{7\pi}{4})$ from polar to rectangular form.