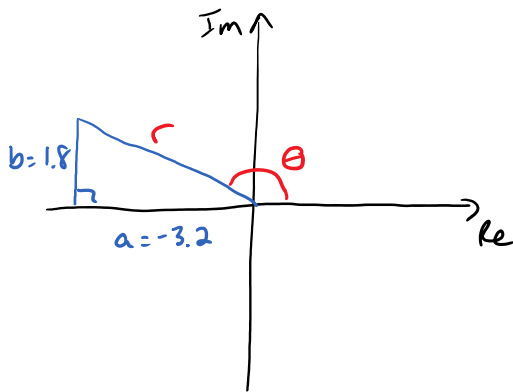


Complex Numbers, cont'd:

Wednesday, October 31, 2018 11:50 AM

example: Convert $z = -3.2 + 1.8i$ to polar notation.
Round all values to one decimal place.



$$\begin{aligned}
 r &= \sqrt{a^2 + b^2} \\
 &= \sqrt{(-3.2)^2 + (1.8)^2} \\
 &\approx 3.67 \\
 &\approx 3.7
 \end{aligned}$$

$$\tan \theta = \frac{b}{a} = \frac{1.8}{-3.2}$$

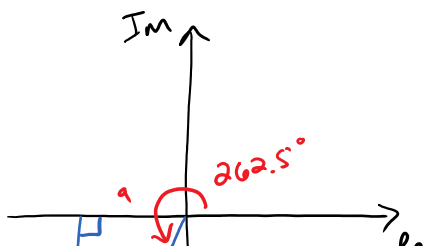
$$\begin{aligned}
 \arctan\left(\frac{1.8}{-3.2}\right) &\approx -29.36^\circ \\
 &\approx -29.4^\circ
 \end{aligned}$$

so to get θ in QII , add 180°
and $\theta \approx 150.6^\circ$

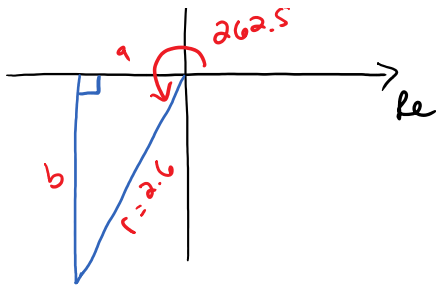
$$\begin{aligned}
 \text{so } z &= r \angle \theta \\
 &= 3.7 \angle 150.6^\circ
 \end{aligned}$$

note: you could if you wish write it in $re^{i\theta}$ form
but θ must be in rads

b) convert $z = 2.6 \angle 262.5^\circ$ to rectangular form



$$\begin{aligned}
 a &= r \cos \theta \\
 &= 2.6 \cos 262.5^\circ \\
 &\approx -0.74
 \end{aligned}$$



$$= 2.6 \cos 262.5^\circ$$

$$= -0.34$$

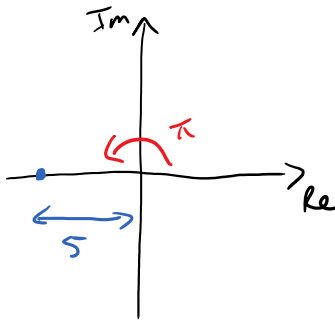
$$b = r \sin \theta$$

$$= 2.6 \sin 262.5^\circ$$

$$= -2.58$$

$$Z = -0.34 - 2.58i$$

c) convert $5e^{i\pi}$ to the form $a+bi$

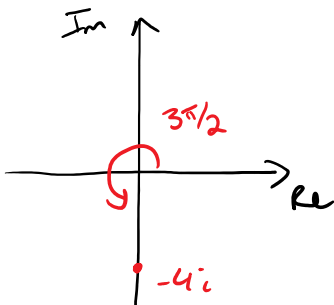


$$a = -5$$

$$b = 0$$

$$Z = -5$$

d) convert $-4i$ to the form $re^{i\theta}$



note: common convention
 $0 \leq \theta < 2\pi$

$$Z = 4e^{i\frac{3\pi}{2}}$$

r is always non-negative

multiplication/division

$$\begin{aligned}(2-i)(3+4i) &= 6 + 8i - 3i - 4i^2 \\ &= 6 + 5i + 4 \\ &= 10 + 5i\end{aligned}$$

$$\begin{aligned}\frac{3i}{1-i} \left(\frac{1+i}{1+i} \right) &= \frac{3i + 3i^2}{1-i^2} \\ &= \frac{3i - 3}{1+1} \\ &= \frac{-3 + 3i}{2} \quad \text{or} \quad \frac{-3}{2} + \frac{3i}{2}\end{aligned}$$

$$(3e^{i\pi/2})(2e^{-i\pi/6}) = 6e^{i(\pi/2 - \pi/6)} = 6e^{i\pi/3}$$

$$\frac{3e^{i\pi/2}}{2e^{-i\pi/6}} = \frac{3}{2} e^{i(\pi/2 + \pi/6)} = \frac{3}{2} e^{i\frac{2\pi}{3}}$$

What about

$$\begin{aligned}(2e^{i\pi/4})^3 &= 2^3 e^{i(\pi/4 \cdot 3)} \\ &= 8e^{i3\pi/4}\end{aligned}$$