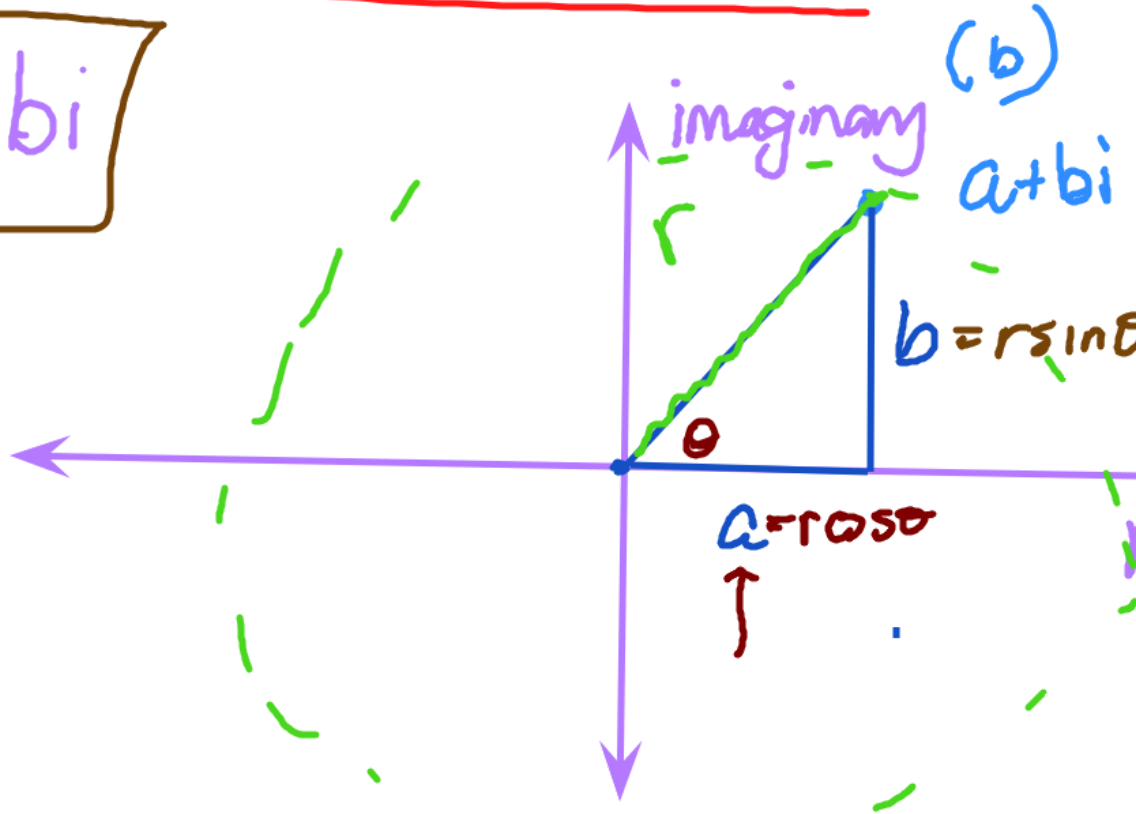
Polar Form of Complex Numbers

$a+bi$



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

$a = r\cos\theta$

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

$b = r\sin\theta$

RECTANGULAR FORM

$z = a + bi$

$a = r\cos\theta$ $\quad$ $b = r\sin\theta$

$z = r\cos\theta + r\sin\theta \cdot i$

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

POLAR FORM OF A COMPLEX NUMBER

r → modulus

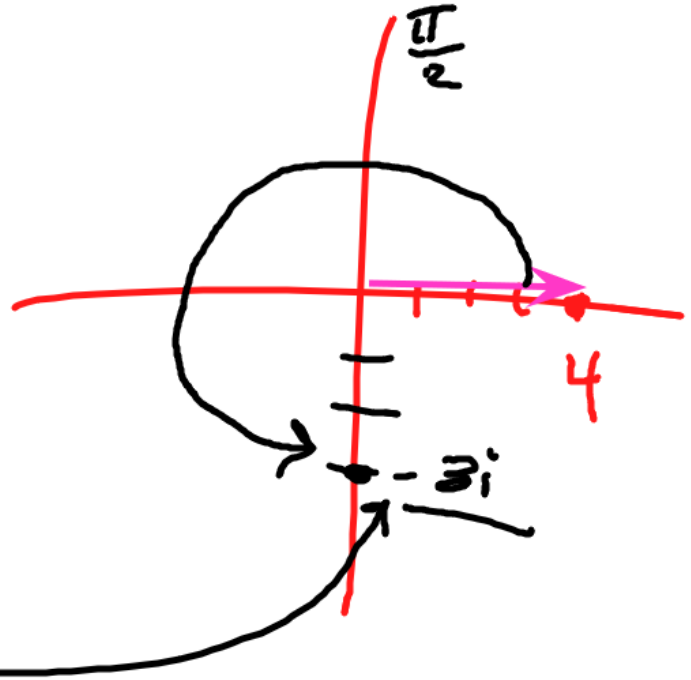
$r(\cos\theta + i\sin\theta)$

$4 : 4(\cos 0 + i\sin 0)$

$1 \quad + \quad 0$

$4 + 0i$

$-3i = 3\left(\cos\frac{3\pi}{2} + i\sin\frac{3\pi}{2}\right)$



$8\left(\cos\frac{2\pi}{3}+i\sin\frac{2\pi}{3}\right)$ → $a+bi$

$\cos\frac{2\pi}{3}=-\frac{1}{2}$, $\sin\frac{2\pi}{3}=\frac{\sqrt{3}}{2}$

$= -4+4\sqrt{3}i$

$(a+bi)(c+d)$

$z_1 = r_1(\cos x + i\sin x)$ $\quad$ $z_2 = r_2(\cos y + i\sin y)$

$z_1 z_2 = r_1(\cos x + i\sin x)\, r_2(\cos y + i\sin y)$

$z_1 z_2 = r_1 r_2 (\cos x + i\sin x)(\cos y + i\sin y)$

$= r_1 r_2 (\cos x\cos y + i\cos x\sin y + i\sin x\cos y + i^2 \sin x\sin y)$

$= r_1 r_2 (\cos x\cos y - \sin x\sin y + i(\sin x\cos y + \cos x\sin y))$

$z_1 z_2 = r_1 r_2 (\cos(x+y) + i(\sin(x+y)))$

Ex

$$2\left(\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}\right)\cdot 4\left(\cos\frac{3\pi}{4}+i\sin\frac{3\pi}{4}\right)$$

$\frac{4\pi}{12}$ $\qquad$ $\frac{9\pi}{12}$

$$= 8\left(\cos\frac{13\pi}{12}+i\sin\frac{13\pi}{12}\right)$$

DIVIDE

$$\frac{z_1}{z_2} = \frac{r_1(\cos x + i\sin x)}{r_2(\cos y + i\sin y)} = \frac{r_1}{r_2}\left(\cos(x-y) + i\sin(x+y)\right)$$

$$\frac{2\cos\left(\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)}{4\cos\left(\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)} = \frac{1}{2}\left(\cos\left(-\frac{5\pi}{12}\right) + i\sin\left(-\frac{5\pi}{12}\right)\right)$$

$z = a + bi$

6.6A p452 8-82 (x4), 38, 39, 42, 43

Thurs 5/7 11:30 am