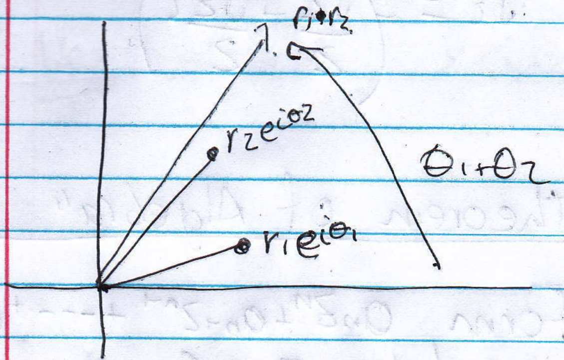
$z_-(a+bi)(c+di) = (ac-bd)+(ad+bc)i$

Claim: $r_1 e^{i\theta_1} \times r_2 e^{i\theta_2} = r_1 r_2 e^{i(\theta_1+\theta_2)}$

So



Proof of Claim:

$r_1 e^{i\theta_1} \times r_2 e^{i\theta_2} \overset{\text{by defn}}{=} r_1(\cos\theta_1 + i\sin\theta_1) * r_2(\cos\theta_2 + i\sin\theta_2)$

using multiplication of complex #s

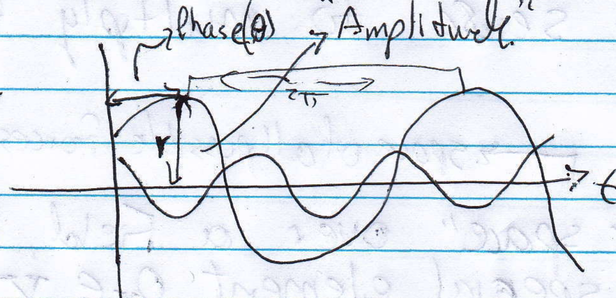
$= r_1 \cdot r_2\big((\cos\theta_1\cos\theta_2 - \sin\theta_1\sin\theta_2) + (\cos\theta_1\sin\theta_2 + \sin\theta_1\cos\theta_2)i\big)$

$\overset{\text{by trig}}{=} r_1 r_2\big(\cos(\theta_1+\theta_2) + i\sin(\theta_1+\theta_2)\big)$

$= (r_1 r_2)(e^{i(\theta_1+\theta_2)})$

Aside: relevance $\mathbb{C}$

Waves



To describe a wave w/ given frequency you need $r, \theta \rightsquigarrow r \cdot e^{i\theta}$

Ohm's Law $= V = R \cdot I$

over $\mathbb{C}$ when dealing w/ AC.

such that VS1 – VS8 hold.

VS1 $\forall x, y \in V \quad x + y = y + x$

VS2 $\forall x, y, z \in V \quad x + (y + z) = (x + y) + z$