Precalc Honor 11.2b Multiplying Complex Numbers Name____________

1a) Multiply the following complex numbers using the FOIL method: $(a+bi)(a+bi)$

$(a+bi)^5$

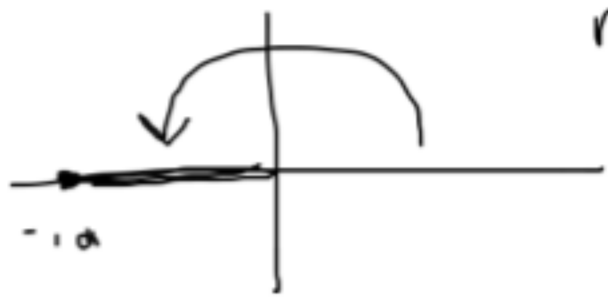
$(\sqrt{2}+i\sqrt{2})(-3\sqrt{2}+3i\sqrt{2})=$

$-6+\cancel{6i}-\cancel{6i}+6i^2$

$-6-6=-12$

$-12+0i$

1b) Convert your product above to polar form.



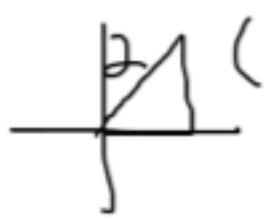

$r=12 \quad \theta=180°$

$r\,\mathrm{cis}\,\theta$

$12\,\mathrm{cis}\,180°$

1c) Convert each of the original complex numbers to polar form.

$(\sqrt{2}+i\sqrt{2})(-3\sqrt{2}+3i\sqrt{2})$




$(2\,\mathrm{cis}\,45°)(6\,\mathrm{cis}\,135°)$

$12\,\mathrm{cis}\,180°$


1d) Compare the complex numbers to their product in polar form. Do you notice anything?

multiply the r's

add the θ's

Multiplying Two Complex Numbers in Polar Form

1. Multiply their r values
2. Add their angles

$$z_1 = r_1 cis\theta_1$$
$$z_2 = r_2 cis\theta_2$$
$$z_1 \cdot z_2 = r_1 cis\theta_1 \cdot r_2 cis\theta_2 = r_1 r_2 cis(\theta_1 + \theta_2)$$

2. Express the following product in both polar and rectangular forms.

(3 cis 165°)(4 cis 45°)

$(r_1 cis\,\theta_1)(r_2 cis\,\theta_2) = (r_1)(r_2)\,cis(\theta_1 + \theta_2)$

$= (3)(4)\,cis(165° + 45°)$

$= 12\,cis\,210°$

$x = r\cos\theta = 12\cos 210° = 12\left(-\frac{\sqrt{3}}{2}\right) = -6\sqrt{3}$

$y = r\sin\theta = 12\left(-\frac{1}{2}\right) = -6$

$a + bi = -6\sqrt{3} - 6i$