Name: ______________________ Period: _______

Complex Polar Form & De Moivre's Theorem Worksheet

1. Convert the following from rectangular form to polar form and vice versa.

a. $-2\sqrt{3} - 2i$	b. $\sqrt{21} + \sqrt{7}i$
c. $\frac{-5\sqrt{2}}{2} - \frac{5\sqrt{2}}{2}i$	d. $2i$
e. $\sqrt{6}\left(\cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)\right)$	f. $2\left(\cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)\right)$
g. $\sqrt{3}\left(\cos\left(\frac{\pi}{6}\right) + i\sin\left(\frac{\pi}{6}\right)\right)$	h. $\sqrt{30}(\cos(\pi) + i\sin(\pi))$

2. Find all three solutions of $\sqrt[3]{64i}$

Recall: $64i = 64\left(\cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)\right)$

The 3rd root: $\left(n = \frac{1}{3}\right)$. There will be 3 roots, each $\frac{2\pi}{3}$ apart.

$(64i)^{1/3} = \left[64\left(\cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)\right)\right]^{1/3}$

Three Solutions:

1. **De Moivre's Theorem:** $64^{\frac{1}{3}}\left(\cos\left(\frac{1}{3}\cdot\frac{\pi}{2}\right) + i\sin\left(\frac{1}{3}\cdot\frac{\pi}{2}\right)\right) =$ ______________________

   Simplify to $a + bi$ form: ____________________

2. Add $\frac{2\pi}{3}$ to #1.

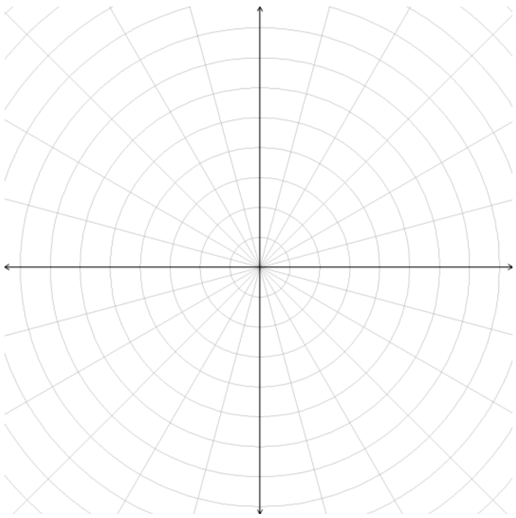
3. Add $\frac{2\pi}{3}$ to #2.

3. Find all five solutions of $\sqrt[5]{16\sqrt{3} + 16i}$

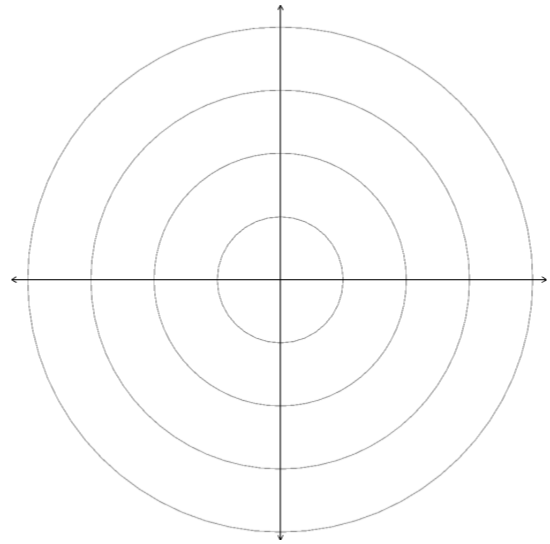
4. Find the fourth roots of -4.

5. Find all solutions to the equation $x^4 + 81 = 0$.

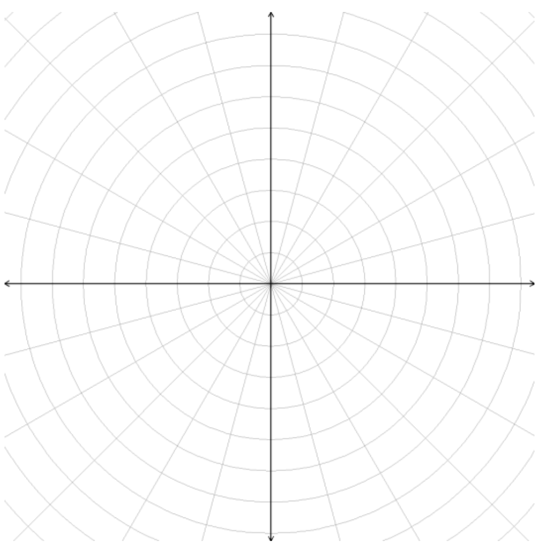
6. Graph the 3 solutions to **#2**.



8. Graph the 5 solutions to **#3**. (Approximate)



7. Graph the 4 solutions to **#4**.



9. Graph the 4 solutions to **#5**.