

DeMoivre WS

Name:

$$\sqrt[n]{re^{\theta i}} = \sqrt[n]{r}e^{\theta i/n}$$

Example: Find the 4 4th roots of the complex Number $8\sqrt{2} + 8\sqrt{2}i$.

Step 1: Convert to polar form:
 $8\sqrt{2} + 8\sqrt{2}i = 16e^{\pi i/4}$

Step 2: Find the 4th root of the radius:
 $\sqrt[4]{16} = 2$

Step 3: Divide the angle by 4:
 $\frac{\pi i}{4} \cdot \frac{1}{4} = \frac{\pi i}{16}$

Step 4: Divide the circle into 4 parts:
 $\frac{2\pi}{4} = \frac{\pi}{2} = \frac{8\pi}{16}$

Step 5: Add the quarter circles of (step 4) to the 1st root angle (Step 3):

$$\sqrt[4]{16e^{\pi i/4}} = 2e^{\pi i/16}, 2e^{9\pi i/16}, 2e^{17\pi i/16}, 2e^{25\pi i/16}$$

Questions:

1. Find the 4 4th roots of 1

2. Find the 5 5th roots of i

3. Find the 3 3rd roots of -1

4. Find the 2 square roots of $\sqrt{3} + i$

5. Find the 3 3rd roots of $4\sqrt{2} + 4\sqrt{2}i$

6. Find the 4 4th roots of $81i$