Roots of Complex Numbers

MATH MONKS

Determine the roots of each complex number in rectangular form. If the answer is not ideal, leave it in polar form.

1 $(-4 + 4\sqrt{3}i)^{\frac{1}{3}}$

2 $(1 + i)^{\frac{1}{3}}$

3 $(-81)^{\frac{1}{4}}$

4 $\left[81\left(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3}\right)\right]^{\frac{1}{4}}$

5 $(3 + 4i)^{\frac{1}{2}}$

6 $(5 + 12i)^{\frac{1}{2}}$

7 $(81)^{\frac{1}{3}}$

8 $(64)^{\frac{1}{3}}$

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MATH MONKS

Answers

1 $(-4 + 4\sqrt{3}i)^{\frac{1}{3}}$

$2(\cos\frac{2\pi}{9} + i\sin\frac{2\pi}{9})$,

$2(\cos\frac{8\pi}{9} + i\sin\frac{8\pi}{9})$,

$2(\cos\frac{14\pi}{9} + i\sin\frac{14\pi}{9})$

2 $(1 + i)^{\frac{1}{3}}$

$\sqrt[6]{2}(\cos\frac{\pi}{12} + i\sin\frac{\pi}{12})$,

$\sqrt[6]{2}(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4})$,

$\sqrt[6]{2}(\cos\frac{17\pi}{12} + i\sin\frac{17\pi}{12})$

3 $(-81)^{\frac{1}{4}}$

$\frac{3\sqrt{2}}{2} + \frac{3\sqrt{2}}{2}i$,

$-\frac{3\sqrt{2}}{2} + \frac{3\sqrt{2}}{2}i$,

$-\frac{3\sqrt{2}}{2} - \frac{3\sqrt{2}}{2}i$,

$\frac{3\sqrt{2}}{2} - \frac{3\sqrt{2}}{2}i$

4 $\left[81(\cos\frac{4\pi}{3} + i\sin\frac{4\pi}{3})\right]^{\frac{1}{4}}$

$\frac{3\sqrt{3}}{2} + \frac{1}{2}i$,

$\frac{3\sqrt{3}}{2} - \frac{1}{2}i$,

$-\frac{1}{2} + \frac{\sqrt{3}}{2}i$,

$-\frac{1}{2} - \frac{\sqrt{3}}{2}i$

5 $(3 + 4i)^{\frac{1}{2}}$

$(2 + i)$, $(-2 - i)$

6 $(5 + 12i)^{\frac{1}{2}}$

$(3 + 2i)$, $(-3 - 2i)$

7 $(81)^{\frac{1}{3}}$

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

8 $(64)^{\frac{1}{3}}$

4, $(-2 + 2\sqrt{3}i)$, $(-2 - 2\sqrt{3}i)$