W15 - Homework

Stepwise problems - Thu. 11:59pm

Complex algebra

01

Complex arithmetic

Write each of these expressions in the form $a + bi$.

(a) $(1 + 3i)(5 - i)$ (b) $\dfrac{2 + 5i}{-3 + 7i}$

02

Complex solutions of quadratic equations

Find all solutions and write them in the form $z = a + bi$.

$$2z^2 + z + 1 = 0$$

Complex exponential

03

Complex forms - exponential to Cartesian

Write each number in the form $a + bi$.

(a) $2e^{i\frac{\pi}{4}}$ (b) $e^{\ln 4 + i\frac{\pi}{2}}$

04

Polar and exponential form

Write down Euler's Formula.

Now write $-5 + 5i$:

(i) in polar form (ii) in exponential form

Complex roots

05

Complex roots using polar

Find the three cube (3^{rd}) roots of $27i$.

Write your answer in the form $a + bi$.

Regular problems - Sat. 11:59pm

Complex algebra

06

Complex arithmetic

Write each of these expressions in the form $a + bi$.

(a) $(2i)^3$ (b) $\sqrt{-4}\sqrt{-16}$

07

Complex solutions of quadratic equations

Find all solutions and write them in the form $z = a + bi$.

(a) $16x^2 + 9 = 0$ (b) $x^2 + \frac{1}{3}x + \frac{1}{9} = 0$

Complex exponential

08

Polar and exponential form

Write down Euler's Formula.

Now write each of the following complex numbers (i) in polar form, and (ii) in exponential form.

(a) $2 - 2\sqrt{3}i$ (b) $6i$

09

Complex products and quotients using polar

For each pair of complex numbers z and w, compute:

$$zw, \qquad \frac{z}{w}, \qquad \frac{1}{z}$$

(a) $z = 1 + \sqrt{3}i, \quad w = \sqrt{3} + i$

(b) $z = 2\sqrt{3} - 2i, \quad w = 6i$

(Use polar forms with $\theta \in [0, 2\pi)$.)

10

Complex powers using polar

Using De Moivre's Theorem, write each number in the form $a + bi$.

(a) $(1 + i)^{16}$ (b) $(\sqrt{3} - i)^5$

(First convert to polar/exponential, then compute the power, then convert back.)

Complex roots

11

Complex roots using polar

Find each of the indicated roots.

(a) The four 4^{th} roots of 1.

(b) The three cube (3^{rd}) roots of $\sqrt{2} + \sqrt{2}i$.

Try to write your answer in $a + bi$ form if that is not hard, otherwise leave it in polar form.