

W15 Regular

Due date: Sunday 4/26, 11:59pm

01

Complex arithmetic

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

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

✍ Complex solutions of quadratic equations

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

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

✍ 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) $6i$

✍ Complex products and quotients using polar

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

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

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

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

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

✍ 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 using polar

Find each of the indicated roots.

- (a) The four 4th roots of 1.
- (b) The three cube (3rd) 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.