Complex Numbers

Algebra 2 · 6 questions · step-by-step answers at the end

Name: Date: Score: / 6

USEFUL EQUATIONS

$i^2 = -1$ $(a + bi)(a - bi) = a^2 + b^2$ $|a + bi| = \sqrt{(a^2 + b^2)}$ $x = [-b \pm \sqrt{(b^2 - 4ac)}]/(2a)$

Questions

Show your working in the space under each question.

1. EASY Write $\sqrt{(-25)}$ in terms of i.

2. EASY Simplify i^3 and i^{10}.

3. MEDIUM Find $|3 - 4i|$.

4. MEDIUM Work out $(2 + i)(2 - i)$.

5. HARD Work out $(3 + i)/(1 - 2i)$.

6. HARD Write $1 + i$ in polar form and use it to find $(1 + i)^8$.

Step-by-step answers

Complex Numbers

1. $\sqrt{25} \times \sqrt{(-1)} = \mathbf{5i}$.

2. $i^3 = i^2 \times i = \mathbf{-i}$. $i^{10} = (i^4)^2 \times i^2 = \mathbf{-1}$.

3. $\sqrt{(9 + 16)} = \mathbf{5}$.

4. $4 - i^2 = 4 + 1 = \mathbf{5}$.

5. Multiply top and bottom by $1 + 2i$: top $= 3 + 6i + i + 2i^2 = 1 + 7i$; bottom $= 5$. **$1/5 + (7/5)i$**.

6. Modulus $\sqrt{2}$, angle 45°. Raising to the 8th power: modulus $(\sqrt{2})^8 = 16$, angle $8 \times 45° = 360°$. So $(1 + i)^8 = \mathbf{16}$.