IB Math Minds

Quiz - Complex Numbers

No GDC allowed on the quiz.

1. Given that $\frac{2}{x+\mathrm{i}y}+\frac{1}{1-2\mathrm{i}}=\frac{2}{5}+\mathrm{i}$ where x and y are real, find the value of x and the value of y.

[6 marks]

2. Find the three cube roots $-2+2\mathrm{i}$ and express them in exponential form, $r\,\mathrm{e}^{\mathrm{i}\theta}$. **[9 marks]**

3. Consider the following two complex numbers

$$z=\frac{3+3\mathrm{i}}{1-\mathrm{i}} \quad \text{and} \quad w=\frac{4}{1+\mathrm{i}\sqrt{3}}$$

(a) Write each in modulus-argument form, $r\,\mathrm{cis}\,\theta$. **[6 marks]**

(b) Hence, find simplified expressions for zw and $\frac{z}{w}$ in modulus-argument form, $r\,\mathrm{cis}\,\theta$.

[6 marks]

4. (a) Find all roots for the equation $x^4+16=0$ given that $x\in\mathbb{C}$. **[8 marks]**

(b) Hence, express x^4+16 as the product of two quadratic polynomials with real coefficients.

[5 marks]

Bonus: Show that $\frac{\cos 2\theta+\mathrm{i}\sin 2\theta}{\cos 3\theta+\mathrm{i}\sin 3\theta}=\cos\theta-\mathrm{i}\sin\theta$ **[+4 marks]**