

L1 Mathematics Interim Assessment 1

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Instructions

1. Time allow: 40 minutes.
2. **Use of electronic calculators is forbidden.**

Question 1: Find all the cube roots of unity ($z^3 = 1$) and represent them in the form $a + bi$ where $a, b \in \mathbb{R}$

Question 2: Find the general solution $y = y(x)$ to the differential equation

$$\frac{dy}{dx} + 3y = 2y^4 e^{5x}$$

Question 3: Find the general solution $y = y(x)$ to the differential equation

$$y'' + 4y = \sin(2x)$$

Question 4: Evaluate the following limit

$$\lim_{x \rightarrow 0} \frac{\sin 7x}{4x}$$

Question 5: For $A \in \mathbb{R}$ let $f : \mathbb{C} \rightarrow \mathbb{C}$ be the function given by

$$f(z) = -Ax^2 - y^2 + x + 2ixy + iy$$

Find a specific value of A for which f satisfies the Cauchy-Riemann equations for any $(x, y) \in \mathbb{R}^2$