Name:

Question 1 **(45 marks)**

$z_1 = 3 + 2i$ and $z_2 = -1 + 2i$ are two complex numbers, where $i^2 = -1$.

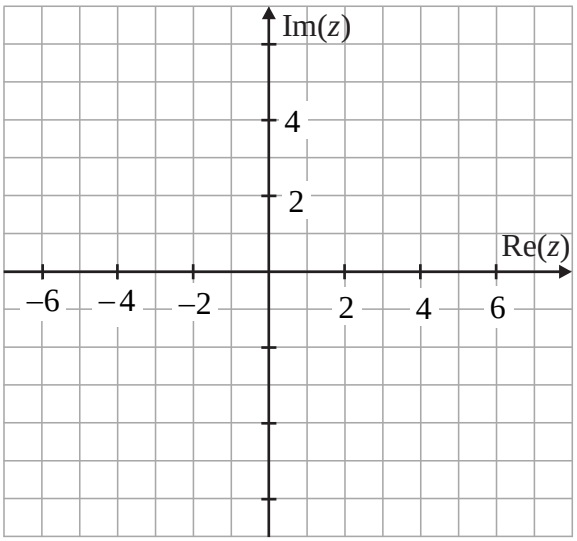
(a) **(i)** Evaluate each of the following complex numbers in the form $a + bi$, where $a, b \in \mathbb{Z}$.

$2z_1 =$

$z_1 + z_2 =$

$iz_1 =$

(ii) Plot each of your answers in part **(i)** on the given Argand diagram and label each point clearly.



(iii) Using your answers to parts **(i)** and **(ii)** above, or otherwise, explain what happens under each of the transformations given in the table below.

Transformation	Evaluation	Explanation
$z = 2z_1$		
$z = z_1 + z_2$		
$z = iz_1$		

(b) Find the complex number z_3 such that $z_3 = \frac{z_1}{z_2}$.

Give your answer in the form $a + bi$, where $a, b \in \mathbb{Z}$.

(c) Write down $\overline{z}_1$ and $\overline{z}_2$.

(d) Check if $\left|\overline{z}_1 + \overline{z}_2\right| = \left|\overline{z}_1\right| + \left|\overline{z}_2\right|$.