Question 2

(25 marks)

Let *G* be the set $\{x + yi \mid x, y \in \mathbb{Z}, i^2 = -1\}$. Consider the Venn diagram below.

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- (a) There are three regions in the diagram that represent empty sets. One of these is shaded. Shade in the other two.
- (b) Insert each of the following numbers in its correct region on the diagram.

$\sqrt{2}$	7	$\sqrt{3}-i$
4+3 <i>i</i>	$\frac{1}{2}$	$\frac{1}{2}$ +2 <i>i</i>

(c) Consider the product ab, where $a \in G$ and $b \in \mathbb{Q}$. There is a non-empty region in the diagram where ab cannot be. Write the word "here" in this region.

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Question 3

(25 marks)

The complex number z has modulus $5\frac{1}{16}$ and argument $\frac{4\pi}{9}$.

(a) Find, in polar form, the four complex fourth roots of z. (That is, find the four values of w for which $w^4 = z$.)



(b) z is marked on the Argand diagram below.On the same diagram, show the four answers to part (a).



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