## Question 4

(25 marks)
(a) The complex numbers $z_{1}, z_{2}$ and $z_{3}$ are such that $\frac{2}{z_{1}}=\frac{1}{z_{2}}+\frac{1}{z_{3}}, z_{2}=2+3 i$ and $z_{3}=3-2 i$, where $i^{2}=-1$. Write $z_{1}$ in the form $a+b i$, where $a, b \in \mathbb{Z}$.

(b) Let $\omega$ be a complex number such that $\omega^{n}=1, \omega \neq 1$, and $S=1+\omega+\omega^{2}+\cdots+\omega^{n-1}$. Use the formula for the sum of a finite geometric series to write the value of $S$ in its simplest form.

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