LCH - Paper 1 - 2015

Question 4 **(25 marks)**

(a) The complex numbers z_1, z_2 and z_3 are such that $\frac{2}{z_1} = \frac{1}{z_2} + \frac{1}{z_3}$, $z_2 = 2 + 3i$ and $z_3 = 3 - 2i$, where $i^2 = -1$. Write z_1 in the form $a + bi$, where $a, b \in \mathbb{Z}$.

(b) Let ω 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.