**(a)** Showing all working and without using a calculator, solve the equation

$$(1 + \mathrm{i})z^2 - (4 + 3\mathrm{i})z + 5 + \mathrm{i} = 0.$$

Give your answers in the form $x + \mathrm{i}y$, where $x$ and $y$ are real. [6]

**(b)** The complex number $u$ is given by

$$u = -1 - \mathrm{i}.$$

On a sketch of an Argand diagram show the point representing $u$. Shade the region whose points represent complex numbers satisfying the inequalities $|z| < |z - 2\mathrm{i}|$ and $\frac{1}{4}\pi < \arg(z - u) < \frac{1}{2}\pi$. [4]