1. Given that $\frac{z}{z+2} = 2 - \mathrm{i}$, $z \in \mathbb{C}$, find z in the form $a + \mathrm{i}b$.

(Total 4 marks)

2. Given that $(a + b\mathrm{i})^2 = 3 + 4\mathrm{i}$ obtain a pair of simultaneous equations involving a and b. Hence find the two square roots of $3 + 4\mathrm{i}$.

(Total 7 marks)

3. Solve the simultaneous equations

$$\mathrm{i}z_1 + 2z_2 = 3$$
$$z_1 + (1 - \mathrm{i})z_2 = 4$$

giving z_1 and z_2 in the form $x + \mathrm{i}y$, where x and y are real.

(Total 9 marks)

4. Find b where $\frac{2+b\mathrm{i}}{1-b\mathrm{i}} = \frac{7}{10} + \frac{9}{10}\mathrm{i}$.

(Total 6 marks)