4.2 (a) (i)

\[ 2x - 3y = -1 \]

\[ \{ z : 2 \Re z - 3 \Im z = -1 \} \]

(ii)

\[ x = y \]

\[ \{ z : \Re z - \Im z > 0 \} \]

(iii)

\[ x + y = -1 \]

\[ \{ z : \Re z + \Im z \leq -1 \} \]

(b) The half-plane contains its boundary, which has equation

\[ \frac{1}{2} x - y = -1. \]

At \( z = 0, \frac{1}{2} x - y > -1, \) and since 0 is not in this half-plane, the half-plane is

\[ \{ z : \frac{1}{2} \Re z - \Im z \leq -1 \}. \]
4.3 (a) (i) 

\[ |z: |z - 1 + 2i| = 1 \] 

(ii) 

\[ |z: \frac{1}{2} \leq |z + 1| < 2 \] 

(iii) 

\[ |z: 2 \leq |z + 2 - 3i| \leq 3 \] 

(b) This set is an open disc with centre \(-1 - i\) and radius \(|-1 - i| = \sqrt{2}\), so it is 
\[ \{z: |z + 1 + i| < \sqrt{2}\}. \]

4.4 (a) (i) 

\[ \{z: |z + i| > \frac{1}{2}\} \] 

4.5 (a) (i) 

\[ \{z: \text{Arg} z = -2\pi/3\} \] 

(ii) 

\[ \{z: \text{Arg}(z - i) = 3\pi/4\} \]
(iii) \( \{ z : \text{Arg} \, z < \frac{2\pi}{3} \} \)

(b) This set is a sector (not an open one) having the rays
\( \{ z : \text{Arg}(z + 2i) = 0 \} \) and \( \{ z : \text{Arg}(z + 2i) = \pi/4 \} \)
as boundary, so it is
\( \{ z : 0 \leq \text{Arg}(z + 2i) \leq \pi/4 \} \).

4.6 (a) (i)

(ii)

(iii)

(iv)

(v)

(vi)

(b) \( C - (A \cup B) \) is the set of points \( z \) which lie in neither
\( A \) nor \( B \); that is,
\( \{ z : \text{Re} \, z \geq 1, |z| > 2 \} \).