1. State the definition of a limit point for a set $A \subseteq \mathbb{R}^n$.

A point $b \in \mathbb{R}^n$ is called a limit point of $A$ if there exists a sequence $\{a^{(k)}\}_{k=1}^{\infty}$ which converges to $b$ and all of whose terms lie in $A$.

2. Define the closure of a set $A \subseteq \mathbb{R}^n$.

The closure of $A$ is the set of all limit points of $A$.

3. Let $A = \{(x_1, x_2) \in \mathbb{R}^2 \mid x_1 \neq x_2\}$. (i) Sketch $A$. (ii) What is the closure of $A$? You need not prove your answer. (iii) Prove that $(0,0)$ is a limit point of $A$.

(i) The picture should be the plane with the line $y = x$ deleted.
(ii) $\mathbb{R}^2$
(iii) The sequence $\{(0, 1/k)\}_{k=1}^{\infty}$ is contained in $A$ (since $1/k$ is never 0) and converges to $(0,0)$. 