1.1

Def: A **metric** is a function $d : X^2 \to \mathbb{R}$ such that: 1. $d(x, y) \geq 0$, and $d(x, y) = 0$ if and only if $x = y$ (Positive Definiteness) 2. $d(x, y) = d(y, x)$ (Symmetry) 3. $d(x, z) \leq d(x, y) + d(y, z)$ (Triangle Inequality)
Def: A **metric space** is a set X with a metric d on it, denoted (X, d).

1.3

Def: Let (X, d) be metric space. An **open ball** of radius r centered at x is $b_r(x) = \{y \in X | d(y, x) < r\}$. (Note the strict inequality)
Let $S \subseteq X$. An element $x_0 \in S$ is an **interior point** of S if there exists $r > 0$ such that $b_r(x_0) \subseteq S$.
Let S^o denote the set of all interior points of S. Then S is **open** if $S = S^o$. (Note that it is sufficient to show $S \subseteq S^o$).
A set $R \in X$ is **closed** if R^c (the complement) is open.