True or False. If true, sketch a proof in a few lines. If false, state a counterexample. Throughout, let $X$ denote a metric space.

1. If $E \subset X$ is compact, then $E^c$ is open.
2. If $E \subset \mathbb{R}$ is countable, then $E$ is closed.
3. If $E \subset X$, and $\epsilon > 0$, then $\bigcup_{p \in E} N_\epsilon(p)$ is open.
4. If $E^c$ is open, then $E$ is open. (Recall that $E^c$ is the set of all interior points of $E$.)
5. The sequence $\{p_n\}$ in $X$ converges if and only if every subsequence of $\{p_n\}$ converges.
6. Given any collection of closed intervals in $\mathbb{R}$, the union of the collection is closed.
7. Every bounded subset of $\mathbb{R}$ is contained in a compact set.
8. Every nonempty compact subset of $\mathbb{R}$ has a limit point.
9. If $E \subset \mathbb{R}$ is bounded, then $\{ a + b \mid a, b \in E \}$ is also bounded.
10. Every subset of $\mathbb{Q}$ which is bounded below in $\mathbb{Q}$ has a greatest lower bound in $\mathbb{Q}$.
11. Every subset of $\mathbb{Q} \subset \mathbb{R}$ which is bounded below in $\mathbb{Q}$ has a greatest lower bound in $\mathbb{R}$.
12. If $E \subset X$ is disconnected, then $\bar{E}$ is also disconnected.
13. If $K \subset X$ is compact and $p \in X$, the set $\{d(p, q) \mid q \in K\}$ has a minimum element.
14. If the sequence $\{p_n\}$ in $\mathbb{R}$ converges, then the sequence $\{p_n^2\}$ also converges.
15. If the sequence $\{p_n^2\}$ in $\mathbb{R}$ converges, then the sequence $\{p_n\}$ also converges.
16. If $|p_n| < 2$ for all $n$, then the sequence $\{p_n\}$ has a convergent subsequence.