1. Prove that for any set S, $z \in \mathbb{C}$ is an interior point to S if and only if z is an exterior point to S^c.

   For any point $z \in \mathbb{C}$, z is an interior point to S if and only if there exists $\epsilon > 0$ such that the ϵ-neighborhood is contained within S which happens if and only if that neighborhood does not intersect S^c. So z is an exterior point to S^c. $\square$

2. Prove that for any set S, $\partial S = \partial S^C$.

   ∂S is the set of all boundary points of S, or points with every neighborhoods intersect with both S and S^c.

   ∂S^C is the set of all boundary points of S^c, or points with every neighborhoods intersect with both S^c and $(S^c)^c = S$.

   So $\partial S = \partial S^c$. $\square$

3. Prove that a set S is open if and only if S^c is closed.

   A set S is open if and only if it does not contain any of its boundary points. So it will also not contain any boundary points of its complement, since $\partial S = \partial S^c$, or $\partial S^c \subset S^c$. Thus S^c is closed. $\square$