Name: ______________________ Score (Out of 9 points):

1. (6 points) Compute the interior, closure, boundary, and set of all limit points of the following sets S. **No justification necessary.**

   (a) Let $X = \{a, b, c, d\}$ with the topology $\Big\{\varnothing, \{a\}, \{b\}, \{a, b\}, \{a, b, c\}, \{a, b, c, d\}\Big\}$, $S = \{b, c\}$.

Int(S): ____________ $\overline{S}$: ____________ ∂S: ____________ Limit points: ____________

   (b) Let $S = (-\infty, 0) \cup \{1\} \subseteq \mathbb{R}$, where $\mathbb{R}$ has the topology $\{(a, \infty) \mid a \in \mathbb{R}\} \cup \{\varnothing\} \cup \{\mathbb{R}\}$.

Int(S): ____________ $\overline{S}$: ____________ ∂S: ____________ Limit points: ____________

   (c) Let $S = \{0, 1\} \subseteq \mathbb{R}$, where $\mathbb{R}$ has the topology $\{U \mid 0 \in U\} \cup \{\varnothing\}$.

Int(S): ____________ $\overline{S}$: ____________ ∂S: ____________ Limit points: ____________

2. (3 points) Each of the following statements is either true or false. If the statement holds in general, write "`True`". Otherwise, state an example of a topological space X and a subset S for which it fails. **No justification necessary.**

   Note: You can get partial credit for correctly writing "`False`" without a counterexample.

   (a) Let $(X, \mathcal{T})$ be a topological space, and $S \subseteq X$. Then every point of $\text{Int}(S)$ is a limit point of S.

   (b) Let $(X, \mathcal{T})$ be a topological space, and $S \subseteq X$. Then $\overline{S} = \overline{\text{Int}(S)}$.

   (c) Let $(X, \mathcal{T})$ be a topological space, and $S \subseteq X$. Then $\partial(\partial S) = \partial S$.