CSC 565: Graph Theory | **North Carolina State University**
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Definition 1. A *simplicial complex* is a pair (V, S), where V is any set (called vertices) and S satisfies

(i) $\sigma \in \mathrm{S} \Rightarrow \sigma \subseteq \mathrm{V}$ [simplices are subsets of V]

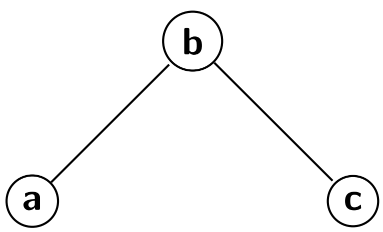
(ii) $\tau \subseteq \sigma \in \mathrm{S} \Rightarrow \tau \subseteq \sigma$ [S is closed under subset]

Elements of S are called *simplices*.

There is a natural way to turn a graph into a simplicial complex

$$\mathrm{simp}(G) = (V_G, \{\emptyset\} \cup E \cup \{\{v\} \mid v \in V_G\})$$

Example 1.



$G = (\{a, b, c\}, \{(a, b), (b, c)\})$

$\mathrm{simp}(G) = (\{a, b, c\}, \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}\})$

Currently, we've covered the categories graphs, simplices, and topologies and the functors between them.