Chapter 3, pg. 34

3.2 $S = \{a, b, c, d\}$

- $\emptyset, \{a\}, \{a, b\}, \{a, b, c, d\}$

✓ Topology on S:
Includes $\emptyset$ and S
All unions of open sets are open.
All finite intersections of open sets are open.
$\{\emptyset\} \cup \{a\} = \{a\}$ open
$\{\emptyset\} \cup \{a, b\} = \{a, b\}$ open
$\{\emptyset\} \cup \{a, b, c, d\} = \{a, b, c, d\}$ open
$\{a\} \cup \{a, b\} = \{a, b\}$ open
$\{a\} \cup \{a, b, c, d\} = \{a, b, c, d\}$ open
$\{a, b\} \cup \{a, b, c, d\} = \{a, b, c, d\}$ open
$\emptyset \cap \{a\} = \emptyset$ open
$\{a\} \cap \{a, b\} = \{a\}$ open
$\{a\} \cap \{a, b, c, d\} = \{a\}$ open
$\{a, b\} \cap \{a, b, c, d\} = \{a, b\}$ open ✓

- $\emptyset, \{a\}, \{b\}, \{a, b, c, d\}$
Not a topology on S:
$\{a\} \cup \{b\} = \{a, b\}$ ~~closed~~ Not Open

- $\emptyset, \{a, c\}, \{a, b, c\}, \{a, c, d\}, \{a, b, c, d\}$

✓ Topology on S:
Includes $\emptyset$ and S
All unions of open sets are open.
All finite intersections of open sets are open.