1. Is \( \{ \land, \lor, \top, \bot \} \) complete? Support your answer.

This set is not complete.

The Boolean function negation \( \neg A \) cannot be represented with these connectives.

In fact, the only truth tables, for formulas using connectives \( \land, \lor, \top, \bot \) are:

\[
\begin{array}{ccc}
A & \top & \bot \\
\top & T & F \\
\bot & T & F \\
\end{array}
\]

If you take the conjunction \( \land \) or disjunction \( \lor \) of any two of these, you get one of the same truth tables again.

\[
\begin{align*}
A \land \top & \equiv A, \\
A \lor \bot & \equiv A, \\
A \land \bot & \equiv F, \\
A \lor \top & \equiv T, \\
A \land A & \equiv A, \\
A \lor A & \equiv A, \\
\top \land \top & \equiv \top, \\
\top \lor \top & \equiv \top, \\
\top \land \bot & \equiv \bot, \\
\top \lor \bot & \equiv \top, \\
\bot \land \bot & \equiv \bot, \\
\bot \lor \bot & \equiv \bot.
\end{align*}
\]

By commutativity of \( \land, \lor \) this covers all cases.