

1.2 Applications of Prop. Logic (cont.) and 1.3 Prop. Equivalences - Worksheet

1. Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is known: Either Kevin or Heather, or both, are chatting. Either Randy or Vijay, but not both, are chatting. If Abby is chatting, so is Randy. Vijay and Kevin are either both chatting or neither is. If Heather is chatting, then so are Abby and Kevin. Explain your reasoning.

2. Use a truth table to verify the distributive law:

$$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$$

3. Use De Morgan's laws to find the negation of each of the following statements:

(a) Kwame will take a job in industry or go to graduate school.

(b) James is young and strong.

4. Show that each statement is a tautology:

(a) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

(b) $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$

5. Show that $(p \rightarrow q) \vee (p \rightarrow r)$ and $p \rightarrow (q \vee r)$ are logically equivalent.