

1. Complete the truth table below using your knowledge of symbolic logic.

| p | q | $\sim q$ | $p \wedge q$ | $p \vee q$ | $p \rightarrow q$ | $q \rightarrow p$ | $p \leftrightarrow q$ | $p \rightarrow \sim q$ | $p \vee q \rightarrow p$ | $p \wedge q \rightarrow q$ |
|---|---|----------|--------------|------------|-------------------|-------------------|-----------------------|------------------------|--------------------------|----------------------------|
| T | T | F        | T            | T          | T                 | T                 | T                     | F                      | T                        | T                          |
| T | F | T        | F            | T          | F                 | T                 | F                     | T                      | T                        | T                          |
| F | T | F        | F            | T          | T                 | F                 | F                     | T                      | F                        | T                          |
| F | F | T        | F            | F          | T                 | T                 | T                     | T                      | T                        | T                          |

Answer questions 2 through 9 based on the truth table above.

2. Which statement is a negation?  $\sim q$
3. Which statements are conditionals?  $p \rightarrow q$ ,  $q \rightarrow p$ ,  $p \rightarrow \sim q$ ,  $p \vee q \rightarrow p$ ,  $p \wedge q \rightarrow q$
4. Which statement is a disjunction?  $p \vee q$
5. Which statement is a biconditional?  $p \leftrightarrow q$
6. Which statement is a conjunction?  $p \wedge q$
7. Which statements are logically equivalent?  $q \rightarrow p$  and  $p \vee q \rightarrow p$
8. Which statement is a tautology?  $p \wedge q \rightarrow q$
9. Determine which of the following statements are tautologies by constructing a truth table. Write yes or no in the space provided.
  - a)  $r \vee \sim r$  yes
  - b)  $r \rightarrow \sim r$  no
  - c)  $(x \vee y) \rightarrow (x \wedge y)$  no
  - d)  $\sim(p \vee q) \leftrightarrow (\sim p \wedge \sim q)$  yes