

1. Make a truth table for the following statements: $p \vee \neg q$, $\neg p \wedge q$, $p \rightarrow \neg q$ and $p \vee (p \rightarrow q)$. Which of these are tautologies, contradictions, negations or equivalents?

2. Write (in English) the contrapositive, converse and negation of the statement: If it is sunny, then I am playing golf or at the beach.

3. Write a symbolic expression for the negations of
 - a) $\exists n \in \mathbb{N}$ such that $e < n < \pi$
 - b) $\forall n \in \mathbb{N}$, $n^2 + n$ is even

4. Prove that if $a|b$ and $a|c$ then $a|(2b + 3c)$.

5. Prove that if $a \equiv b \pmod{n}$ and $b \equiv c \pmod{n}$ then $a \equiv c \pmod{n}$

6. Prove that for all integers n , if n^2 is even then n is even.

7. Prove or disprove: if $x \in \mathbb{Q}$ and $y \in \mathbb{Q}^c$ then $xy \in \mathbb{Q}^c$

8. Prove that every odd integer n can be written as $4k + 1$ or $4k + 3$ for some integer k .