
1. Explain without using truth tables why the following compound proposition is true only when \( p, q, r \) have the same values:

\[
(p \lor \neg q) \land (q \lor \neg r) \land (r \lor \neg p)
\]

2. Are the following two equivalent?

\[
(p \land q) \to r
\]

\[
(p \to r) \land (q \to r)
\]

3. Section 1.5 [6th ed.: Section 1.4], Problem 25

4. Section 1.5 [6th ed.: Section 1.4], Problem 40

5. Prove the following:

\[
\wp(A) \subseteq \wp(B) \leftrightarrow A \subseteq B
\]

6. Both editions, Section 2.2, Problem 25

7. For all functions and mappings below, state whether they are injective, surjective or both (bijective):

(a) \( f : A \to B \), \( f(x) = \frac{1}{x} \)
(b) \( f : B \to C \), \( f(x) = x^2 \)
(c) \( f : B \to B \), \( f(x) = x^2 \)
(d) \( f : C \to B \), \( f(x) = x^2 \)

where:

(a) \( A = \{x|x \in \mathbb{R}, x \geq 1\} \)
(b) \( B = \{x|x \in \mathbb{R}, 0 \leq x \leq 1\} \)
(c) \( C = \{x|x \in \mathbb{R}, -1 \leq x \leq 1\} \)

8. Which of the following integers is congruent to 3 \( \mod 7 \)?

(a) 37
(b) 66
(c) -17
(d) -67


10. Section 4.3, Problem 51 [6th ed.: Section 3.6, Problem 33]

11. Using \( p = 29 \) and \( q = 47 \) encrypt the message “NO” using the RSA cryptosystem