

Homework Assignment 1

Exercise 1

Let $A = \{-3, -2, -1, 0, 1, 2, 3\}$ and $B = \{-4, -2, 0, 2, 4\}$ be subsets of the Universal Set $U = \{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}$. Verify by calculation that: $(A \cup B^c)^c = A^c \cap B$.

Exercise 2

If $A = \{\{1\}, \emptyset\}$, find the Power Set of A .

Exercise 3

Find the truth table of the statement $[p \vee (q \wedge \neg r)] \rightarrow \neg q$.

Exercise 4

Give the **converse**, **inverse**, **contrapositive** and **negation** of the statement: *All people who live in glass houses do not throw stones.*

Exercise 5

For the given set of premises, show the following is a valid argument.

$$\begin{array}{c}
\neg r \wedge s \\
q \rightarrow r \\
p \wedge s \rightarrow t \\
p \vee q \\
\dots\dots\dots \\
\therefore t
\end{array}$$

Exercise 6

Find a proposition with three variables p , q , and r that is true when p and r are true and q is false, and false otherwise.

Exercise 7

Find a proposition with three variables p , q , and r that is true when exactly one of the three variables is true, and false otherwise.

Exercise 8

Find a proposition with three variables p , q , and r that is never true.

Exercise 9

Find a proposition using only p , q , \neg , and \vee with the given truth table.

p	q	?
T	T	F
T	F	T
F	T	T
F	F	F

Exercise 10

Determine whether $p \rightarrow (q \rightarrow r)$ and $p \rightarrow (q \wedge r)$ are equivalent.

Determine whether $p \rightarrow (q \rightarrow r)$ is equivalent to $(p \rightarrow q) \rightarrow r$.

Determine whether $(p \rightarrow q) \wedge (\neg p \rightarrow q) \equiv q$.

Write a proposition equivalent to $p \vee \neg q$ that uses only p , q , \neg and the connective \wedge .

Write a proposition equivalent to $\neg p \wedge \neg q$ that uses only p , q , \neg and the connective \vee .