ProofSpace Comprehension Quiz

Preliminaries

Logical Identities and Equivalence

1 Which of the following is logically equivalent to $P \Rightarrow Q$?

(a) $Q \Rightarrow P$

(b) $\neg P \Rightarrow \neg Q$.

(c) $P \wedge \neg Q$.

(d) None of the above options.

2 Which of the following is logically equivalent to $\neg(P \Rightarrow Q)$?

(a) $P \wedge \neg Q$

(b) $\neg P \wedge Q$.

(c) $\neg P \vee Q$.

(d) None of the above options.

3 For each equivalence in Column A, choose the appropriate identity used from Column B. Each entry in Column B may be used no more than once.

Column A

_____**1)** $(P \vee P) \equiv P$.

_____**2)** $(P \iff Q) \equiv (P \Rightarrow Q) \wedge (Q \Rightarrow P)$.

_____**3)** $\neg(P \wedge Q) \equiv (\neg P \vee \neg Q)$.

_____**4)** $\neg(\neg(\neg(P)) \equiv (\neg P)$.

_____**5)** $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$.

Column B

a) Biconditional Statements

b) Conditional Statements

c) Conditional Statements with Disjunctions

d) DeMorgan's Laws

e) Double Negation

f) Distributive Laws

g) Idempotence

4 Which of the following are valid ways to prove two sentences logically equivalent? Select all those you think are appropriate.

(a) Use a truth table.

(b) Consider an example.

(c) Show a counterexample to their negations

(d) Use logical identities.

5 Consider the statement "If 3 is even, then 73 is odd." Which of the following is the best negation of this statement?

1. If 3 is not even, then 73 is not odd.
2. 3 is not even and 73 is not even.
3. 3 is even and 73 is not odd.
4. None of the above options.