

CISC 2210 Spring 2018 Quiz 2

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1 Basic Logic (3 points)

Let:

O = "3 is an odd number."

E = "4 is an even number."

P = " π is a rational number."

Q = " $\pi = q$ for some $q \in \mathbb{Q}$."

Express the following in logical notation:

1. 3 is an even number or 4 is an even number.
2. π is an irrational number.
3. If π is a rational number, then $\pi = q$ for some $q \in \mathbb{Q}$.

2 Truth tables (2 points)

Create a truth table for $(P \vee Q) \rightarrow R$

3 Logic Proofs (5 points)

1. Prove that $(\neg Q \wedge (P \rightarrow Q)) \rightarrow \neg P$ is tautological. (2 points)

2. Prove that $\neg(P \wedge Q)$ is logically equivalent to $\neg P \vee \neg Q$ (3 points)

4 Functions (5 points)

1. Consider $f : \mathbb{R} \rightarrow \mathbb{R}$ such that $f(x) = 5x - 7$.

(a) Prove that f is invertible. (2 points)

(b) Find f^{-1} . (1 point)

2. Let $S = \mathbb{N}$ and let $A = \{1, 2, 3, 4, 5\}$. Consider $\chi_A : \mathbb{N} \rightarrow \{0, 1\}$.

Prove that χ_A is onto, but is **NOT** one-to-one. (2 points)