

practice quiz.

This is a practice quiz. Its purpose is to give you a chance to evaluate your knowledge of logic, sets, relations and functions.

When you think you are ready, sit down with closed books and take 60 minutes to see how much you can cover.

Exchange the your test with another student in the class and grade each others test.

Name: _____

1. The proposition $p \text{ NAND } q$ is false only when both p and q are true.
 1. Show the truth table of this logic operator.
 2. Show that NAND is logically equivalent to \vee
 3. Show that NAND can be used to implement \wedge

2. *What is a tautology?*

Determine whether $[\neg p \wedge (p \rightarrow q)] \rightarrow \neg q$ is a tautology.

3. a. What is a countable set?
- b. Construct a bijection between $\mathbb{N} \times \mathbb{N} \times \mathbb{N}$ and \mathbb{N} .
- c. Which triple will be in location 45 according to your bijection?
(You are expected to construct the bijection first and then use it to determine the triple in this location).

4. Determine whether the relation R on \mathbb{Z}^+ defined: by $(a R b)$ if " $|a^2 - b^2|$ is divisible by 4" is:
 1. reflexive
 2. symmetric
 3. antisymmetric
 4. transitive.

5. Prove that if m is a positive integer and x a real number then:

$$\lfloor mx \rfloor = \lfloor x \rfloor + \left\lfloor x + \frac{1}{m} \right\rfloor + \left\lfloor x + \frac{2}{m} \right\rfloor + \cdots + \left\lfloor x + \frac{m-1}{m} \right\rfloor$$