

Names \_\_\_\_\_

Problem 2

1. Construct a truth table for  $p \Rightarrow \neg p \wedge \neg q$ .

2. Construct a truth table for  $p \vee q \Rightarrow \neg p \wedge \neg q$ .

Problem 3

(a) Write each sentence as a fully quantified expression by defining appropriate sets and predicates. Then, write an English sentence that expresses the logical *negation* of the sentence. If a sentence is ambiguous in its meaning, describe all of the interpretations of the sentence that you can find, and then choose one and give its fully quantified expression and logical negation (in English).

- There is a point in Minnesota that is farther than 10 miles from a lake.
- Every sorting algorithm takes at least  $n \log n$  steps on some  $n$ -element input array.

(b) Draw the Venn diagram of the set  $(B \cup C) - A$ .

Problem 4

Fill in the rest of the proof by contradiction of the following claim.

*Claim.*  $\sqrt{2}$  is not rational.

*Proof.* For the sake of contradiction, assume that  $\sqrt{2}$  is rational.

statement

$\sqrt{2} = \frac{n}{d}$ ,  $n, d \in \mathbb{Z}$ ,  $n, d$  in

lowest terms (can't have a common divisor)

reasoning

definition of rational