

Homework 1.

Due Wed. Sep 11, 2013.

Problem 1

Using the following propositions:

p : “Phyllis go out for a walk”.

r : “The Moon is out”.

s : “It is snowing”.

Formulate the following expressions in words:

1. $(r \wedge \neg s) \rightarrow p$
2. $r \rightarrow (\neg s \rightarrow p)$
3. $\neg(p \leftrightarrow (s \vee r))$

Problem 2

For each of the propositions in the problem 1, write out the truth table.

Problem 3

Using the truth table method, prove the logical equivalence

$$\neg((a \wedge b) \wedge c) \equiv \neg a \vee (\neg b \vee \neg c).$$

After that, show the same result, using De Morgan’s Law and associativity of \vee .

Problem 4. Knights and Knaves

The problem is given and discussed as an example in Rosen (ed.6: p. 14; ed.7: p. 19):

In [Sm78] Smullyan posed many puzzles about an island that has two kinds of inhabitants, knights, who always tell the truth, and their opposites, knaves, who always lie. You encounter two people A and B. What are A and B if A says “B is a knight” and B says “The two of us are opposite types”?

Give your solution to this problem. Simple verbatim copy from the book is not accepted.

A hint: The textbook provides a correct but rather convoluted verbal argument, you can try to rephrase it as a truth table.