

### Example from end of class 2/7

Show that the premises "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming, then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "We will be home by sunset."

#### Solution:

Let  $p$  be the proposition "It is sunny this afternoon,"  $q$  the proposition "It is colder than yesterday,"  $r$  the proposition "We will go swimming,"  $s$  the proposition "We will take a canoe trip," and  $t$  the proposition "We will be home by sunset."

**Important:** Please note the following correction: "We will go swimming only if it is sunny," should be translated as "If we go swimming then it is sunny," i.e. " $r \rightarrow p$ "

1.  $\neg p \wedge q$  Premise
2.  $r \rightarrow p$  Premise
3.  $\neg r \rightarrow s$  Premise
4.  $s \rightarrow t$  Premise
5.  $\neg p$  Simplification using 1.
6.  $\neg r$  Modus tollens using 2. and 5.
7.  $s$  Modus ponens using 3. and 6.
8.  $t$  Modus ponens using 4. and 7.