MATH 113: 2/3 WORKSHEET

The vocabulary of *truth-functional logic* (also called *propositional logic*) has two types of symbols. *Variables* $A, B, C, \ldots$ stand in for declarative sentences. Whereas *connectives* are about how to combine simpler things together to make compound statements.

Negation ($\neg$)
$\neg A$ means "it is not the case that A", or more shortly "not A".

Conjunction ($\wedge$)
$A \wedge B$ means "both A and B".

Disjunction ($\vee$)
$A \vee B$ means "either A or B (possibly both)".

Conditional ($\rightarrow$)
$A \rightarrow B$ means "if A then B".

Biconditional ($\iff$)
$A \iff B$ means "A if and only if B".

We can use multiple connectives to make a more complicated statement. We use parentheses to denote precedence—which connective happens first.

- $A \rightarrow (B \vee C)$ means "if A then either B or C".
- $(A \wedge B) \vee C$ means "either both A and B or else C".
- $(A \vee B) \wedge C$ means "either A or B and also C".

Translate the following sentences of truth-functional logic into ordinary English. Choose for yourself the meaning of each variable.
(1) $M \wedge S$
(2) $S \vee R$
(3) $\neg S \wedge \neg R$
(4) $H \to R$
(5) $V \to (M \vee Z)$
(6) $(P \vee D) \wedge S$

Translate the following English sentences into the language of truth-functional logic. For each of them, introduce variables for the atomic statements (those which cannot be broken down any further).
(1) Mary had a little lamb, its fleece was white as snow.
(2) It will either snow tomorrow or else it will rain.
(3) It will neither snow nor rain tomorrow.
(4) If Laika is a hero then her sacrifice should be remembered.
(5) If Denise visits this weekend, we will either go to the museum or go to the zoo.
(6) I will either go to the protest or donate to the bail fund, but either way I will help make signs.