

# Assignment I

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1. Let  $P$  represent “Snow is white”,  $Q$  represent “Grass is blue”, and  $R$  represent “It will rain”. Write out English sentences equivalent to each of the following expressions: make sure that your sentences really are grammatical English and are as clear as possible. Remember order of operations:  $\neg$  has the highest precedence, followed by  $\wedge$ ,  $\vee$ ,  $\rightarrow$  and  $\leftrightarrow$ . It doesn't hurt to add extra parentheses for clarity.

(a)  $\neg Q$

(b)  $\neg P \vee Q$

(c)  $(P \rightarrow Q) \wedge (Q \rightarrow \neg R)$

(d) \*  $(P \rightarrow Q) \rightarrow R$  The star means this part is harder.

Write out expressions of propositional logic equivalent to the following English sentences:

(a) Either snow is not white or grass is not blue.

(b) If snow is white and grass is not blue, then it will rain.

(c) Snow is not white and if grass is not blue then it will rain.

2. Show that  $\neg(P \wedge \neg Q)$  is logically equivalent to  $P \rightarrow Q$ , using the method of truth tables.
3. Show that  $(P \wedge Q) \rightarrow R$  is logically equivalent to  $(P \rightarrow R) \vee (Q \rightarrow R)$ , using the method of truth tables.