Homework 1.

1. Represent the logical form of each of the following sentences. First identify the elementary component sentences, and abbreviate each with a (distinct) capital letter. (We have suggested letters after each sentence.) Then translate the original sentence using the logical connectives $\lor$, $\&$, $\neg$, $\rightarrow$ for the words “or”, “and”, “not”, “if...then...”. Use parentheses to indicate the order of precedence of the different logical connectives.

   (a) If Wittgenstein wrote the *Tractatus* then he did not invent the printing press. ($W, I$)

   (b) It’s just not true that if Jane Austen wrote it then it has a happy ending. ($W, H$) [Does this sentence admit an alternative symbolization?]

   (c) Hegel was either a great philosopher or a raving lunatic. ($G, R$)

   (d) Hegel was neither a great philosopher nor a great historian. ($G, H$)

   (e) Sieglinde will survive, and either her son will gain the Ring and Wotan’s plan will be fulfilled or else Valhalla will be destroyed. ($S, G, F, D$)

   (f) Wotan and Alberic will not both be satisfied. ($W, A$)

2. Represent the logical form of the following arguments. (We have suggested letters for the elementary sentences.)

   (a) Aquinas and Occam were not both great philosophers. But Occam was not a great philosopher. So, Aquinas was a great philosopher. ($A, O$)

   (b) If according to the law a fetus is not a person, then nobody can be legally charged for murdering a fetus. Somebody can be legally charged for murdering a fetus. Therefore, according to the law a fetus is a person. ($P, C$)

   (c) Either I will join Ivy and become a robber baron, or I will join Terrace and become a writer. If I become a writer, I will be poor. So, either I will become a robber baron or I will be poor. ($I, R, T, W, P$)
3. Prove that the following argument forms are valid. You may use the following rules of inference: MPP, & I, & E, ∨ I, DN.

(a) (1) $P \& Q$  / $P \lor Q$

(b) (1) $(A \lor B) \rightarrow T$
(2) $Z \rightarrow A$
(3) $T \rightarrow W$
(4) $Z$  / $W$

(c) (1) $A \rightarrow B$
(2) $C \rightarrow A$
(3) $W \rightarrow Z$
(4) $C \& W$  / $(B \lor D) \& (Z \lor E)$

(d) (1) $(F \rightarrow G) \rightarrow \neg F$
(2) $D \rightarrow (F \rightarrow G)$
(3) $(A \rightarrow D) \& A$  / $G \lor \neg F$

(e) (1) $(A \rightarrow B) \rightarrow (C \rightarrow D)$
(2) $(F \rightarrow A) \rightarrow (A \rightarrow B)$
(3) $A \rightarrow (F \rightarrow A)$
(4) $A \& C$  / $D \& B$

(f) (1) $(U \lor W) \rightarrow (\neg \neg T \rightarrow R)$
(2) $U \& H$
(3) $T \& \neg H$  / $U \& R$
4. Give informal counterexamples to the following invalid argument forms.
(i.e., give arguments with these forms that have true premises and a false conclusion)

(a) (1) \( P \lor Q \quad / \quad P \)

(b) (1) \( (P \& Q) \rightarrow R \quad / \quad P \rightarrow R \)

(c) (1) \( P \rightarrow (Q \lor R) \quad / \quad P \rightarrow Q \)

5. Is the following argument form valid? If you think it is valid, try to explain your intuition. If you think it is invalid, give an informal counterexample.

\( (A \lor B) \rightarrow (C \& D) \quad / \quad A \rightarrow C \)