Assignment #3. Due Thurs Feb 18.

1. Explain why each of the following are true claims about **PLC**.

(a) For any *wff*s A, B, if $A \vDash B$ and $B \vDash C$, then $A \vDash C$.

(***Hint***: This says "If A tautologically entails B, and B tautologically entails C, then A tautologically entails C." To prove it, assume that A tautologically entails B, and B tautologically entails C. Then try to show that from this it follows that A tautologically entails C. To do this, you need to apply the definition of tautological entailment.)

(b) For any *wff*s A, B, if $A \vDash \neg B$, then it's not the case that $A \vDash B$.

(c) For any *wff*s A, B, if $\vDash (A \vee B)$ and $\vDash \neg(A \wedge B)$, then $A \vDash \neg B$ and $\neg B \vDash A$.

(***Hint***: This says "If $(A \vee B)$ is a tautology and $(A \wedge B)$ is a contradiction, then A tautologically entails $\neg B$ and $\neg B$ tautologically entails A (*i.e.*, A and $\neg B$ are truth-functionally equivalent).

3. Recall that the corresponding conditional of an argument in **PLC** is a conditional *wff* whose consequent is the conclusion and whose antecedent is the conjunction of all the premises. Determine whether the following arguments in **PLC** are tautologically valid by evaluating their corresponding conditionals.

(a) $(\neg P \wedge Q) \therefore \neg(P \wedge Q)$

(b) $P, \neg P \therefore Q$