

5.4.x. Exercise questions

1. Use derivations to check each of the claims below; if a derivation indicates that a claim fails, present a counterexample that divides an open gap. Since **d** is a claim of tautologousness, it is established by a derivation that begins with only a goal and no initial premises.
 - a. $A \rightarrow B \Leftrightarrow \neg A \vee B$
 - b. $(A \wedge B) \rightarrow C \Leftrightarrow A \rightarrow C$
 - c. $(A \rightarrow B) \wedge (B \rightarrow C) \Leftrightarrow A \rightarrow C$
 - d. $\Rightarrow ((A \rightarrow B) \rightarrow A) \rightarrow A$
2. Construct derivations for each of the following. These exercises are designed to make attachment rules often useful. The derivations can be constructed for the English sentences in **e-g** without first analyzing them since you generally need to recognize only the main connective and the immediate connectives in order to know what rules apply; however, the abbreviated notation provided by an analysis may be more convenient.
 - a. $(A \wedge B) \rightarrow C, (C \vee D) \rightarrow E, A, B \Rightarrow E$
 - b. $(A \vee \neg B) \rightarrow C \Rightarrow \neg C \rightarrow B$
 - c. $\neg(A \wedge B), B \vee C, D \rightarrow \neg C \Rightarrow A \rightarrow \neg D$
 - d. $C \rightarrow \neg(A \vee B), E \vee \neg(D \wedge \neg C), D \Rightarrow A \rightarrow E$
 - e. *Tom will go through Chicago and visit Sue*
Tom won't go through both Chicago and Indianapolis
Tom won't visit Ursula without going through Indianapolis
Tom will visit Sue but not Ursula
 - f. *Either we spend a bundle on television or we won't have wide public exposure*
If we spend a bundle on television, we'll go into debt
Either we have wide public exposure or our contributions will dry up
We'll go into debt if our contributions dry up and we don't have large reserves
We won't have large reserves
We'll go into debt
 - g. *If Adams supports the plan, it will go through provided Brown doesn't oppose it*
Brown won't oppose the plan if either Collins or Davis supports it
The plan will go through if both Adams and Davis support it