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Assignment #4

Exercise 4.3

1. If the atomic sentence A is logically true, then that would equate to sentences 1 and 4 being logically necessary based on the tables presented (4.2.1 & 4.2.4). You will remain with all truths even if all the rows where the atomic sentence A is false. Therefore it is a logical necessity because, according to the rules, all tautologies are logical necessities. Sentence 2 would also be logically necessary because after removing the rows where atomic sentence A is false, we are left with all truths within that main conjunction. Therefore it would be a tautology and be logically necessary.
   Sentence 3 would not be logically necessary because if atomic sentence B was true and sentence c was false, then it would be false because both would need to be true to conclude true. Therefore because there is an instance where sentence 3 is false then it is not logically necessary.
2. If the atomic sentence A is logically false, then that would equate to sentences 1 and 4 being logically necessary based on the tables presented (4.2.1 & 4.2.4). You will remain with all truths even if all the rows where the atomic sentence A is false. Therefore it is a logical necessity because, according to the rules, all tautologies are logical necessities. Sentence 2 would also not be logically necessary because after removing the rows where atomic sentence A is false, we are left with all truths within that main conjunction. Therefore there are situations where the sentence is false and concludes to not being a logical necessity.
3. Sentence 2 be logically necessary because after removing the rows where atomic sentence A is false, we are left with all truths within that main conjunction. Therefore it would be a tautology and be logically necessary.

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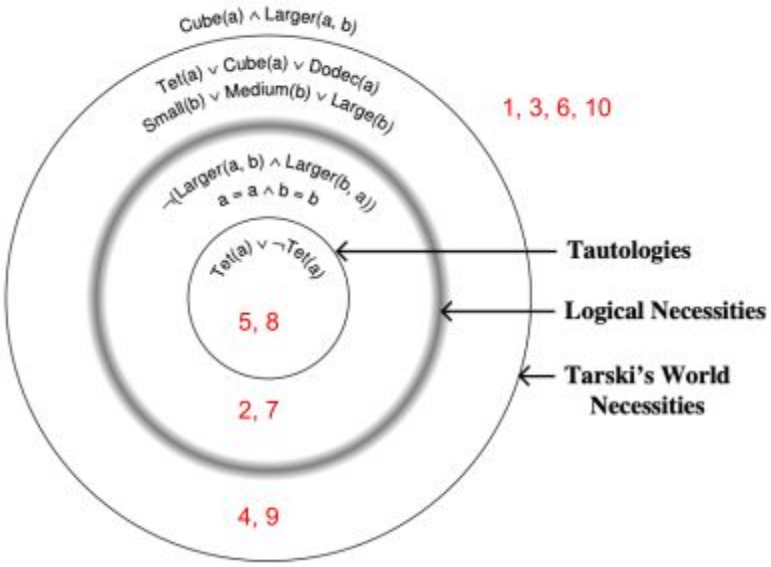
Exercise 4.8



Exercise 4.19

1. TW-equivalence is a specific instance of logical equivalence and therefore follows this rule: all the sentences that are TW-equivalent are logically equivalent but does not work the other way around; all sentences that are logically equivalent are not always TW-equivalent. This is not the case for tautologically equivalent: TW-equivalent sentences are tautologically equivalent, and sentences that are tautologically equivalent can be TW-equivalent; however, this does not imply that one equivalence is an existence of another.
2. Sentence 1: SameCol(a, b) ∧ SameRow(a, b)
   Sentence 2: c = d