Final Exam

Philosophy 305

April 21-28, 2022

Instructions

- You have **3 hours** for the exam.
- Type up any answers you can.
- But for things you can't type - especially trees - write them out on paper, take a photo of them, and upload the photo.

Propositional Logic

For each of the following sequents, do **both** a truth table and a truth tree to test whether it is valid. And say whether the sequent is valid.

1. $A \rightarrow B \vDash A \vee B$
2. $\neg A, \neg B \vDash \neg(A \vee B)$

Proofs

3. $Q \rightarrow (P \wedge S), Q \wedge R \vdash P \wedge R$
4. $Q \rightarrow (P \wedge R) \vdash Q \rightarrow P$
5. $R \rightarrow Q, (P \vee Q) \rightarrow \neg R \vdash \neg R$

Probability

6. If $\Pr(B|A) = 0.25$, $\Pr(B|\neg A) = 0.75$ and $\Pr(A) = 0.4$, what is $\Pr(B)$?
7. A friend of yours comes to you feeling very worried. When she was at the hospital getting blood work done for a routine check up, they ran some other tests and one of them came back positive for a disease that is very rare (less than 0.1% of the population have it) but very serious. Your friend is worried because everyone who has the disease tests positive, but 90% of people who don't have the disease test negative. (Assume all tests are positive or negative.) How worried should your friend be? What might you say to reassure them?

Modal Logic

For each of the following sentences, do **three** truth trees: one to check whether it is a logical truth in K, one to check whether it is a logical truth in S4, and one to check whether it is a logical truth in KT4B (i.e., S5). You can use the simplified rules for S5.

8. $\Box A, \Box\Box A \rightarrow B \vDash B$
9. $\neg\Box\Diamond A \vDash \neg\Diamond A$

Conditionals

10. Show that this is not a theorem of S5: $\Box(A \rightarrow B) \vee \Box(B \rightarrow A)$
11. Describe a sphere model (from the minimal change semantics chapter of Boxes And Diamonds) that shows $(A \;\Box\!\!\rightarrow B) \rightarrow ((A \wedge C) \;\Box\!\!\rightarrow B)$ is not a logical truth in the minimal change semantics.