

# Final Exam

Philosophy 305

April 23-28

## 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.
- Note that there will be fewer questions than this on the final, but the structure will be similar. The point of this is to give you a sense of the kind of questions that there will be.

## 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.  $A \rightarrow B \models A \vee B$
2.  $\neg A, \neg B \models \neg(A \vee B)$

## 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 disease. 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.