- The midterm will be on Oct. 20 (Th). The exam covers Chs. 1 - 9, except for the following sections which are <u>not</u> covered:
    - 1.5-1.8, 2.6, 3.8, 4.5-4.6, 7.4-7.5, 8.3, and 9.7-9.8
- The material we will discuss on Oct. 18 (Tu) <u>is</u> included in the midterm. So, budget your time wisely.
- It's a good idea to solve all of the problems in the above chapters (except the questions in the excluded sections), especially the formal proof questions.
- Make sure you understand the mistakes you made in the homeworks.
- By Oct. 17, you will finish the sixth homework, which covers up to and including Ch. 8. However, you have not done homework on Ch. 9. So it's a good idea to solve the following questions and send the solutions to the Grade Grinder (checking "Just me" when submitting, since these are not homeworks) to get feedback:
    - 9.9
    - 9.12
    - 9.16
    - 9.17
- In addition to proofs, the following concepts are especially important:
    - validity
    - tautology, logical truth, TW-necessity
    - logical possibility vs. TW-possibility
- Extra help:
    - Monday 17 October 1:30-3:00 Karin Fransen, office in CT Hall
    - Tuesday 18 October 12:30-2:00 Keith DeRose + Charles More, in CT Hall 410
    - Tuesday 18 October 2:30-4:00 Charles More in Connecticut Hall 103
    - Wednesday 19 October 2:30-4:20 open sections by Larry Jorgensen in Phelps Hall 407
    - Wednesday 19 October 3:30-4:30 Karin Fransen, office in CT Hall
- A sample midterm begins on the next page.

• This is a sample midterm exam.

For either informal or formal proofs, you need to cite the rules and may use *only* basic rules of inference, but no law or no theorem. No Taut Con can be used.

1. Translate the following sentences into Tarski's World Language.

  (a) a and b are both in back of c.

  (b) Neither a nor b is in front of either c or d.

  (c) d is large only if none of a, b, and c are cubes.

  (d) Some cube is neither small nor large.

  (e) No cube is large.

2. Are the following logically equivalent to each other? If so, show us that they are. If not, show us why not.

$$P \to (Q \to R) \qquad (P \to Q) \to R$$

3. Convince us that the following sentence is true:

   Not every logically possible sentence is TW-possible.

4. Let us introduce a three-place sentential connective symbol #, called the majority symbol. So, the following clauses are added to the syntax and the semantics of our language, respectively.

   If P, Q and R are sentences, so is $(\# PQR)$.

   '$(\# PQR)$' is true *if and only if* the majority of P, Q and R are true.

  (a) Please fill out the following truth table.

P	Q	R	$(\#PQR)$

5. Translate each of the following arguments into a sentential language. If it is a valid argument, then give a proof (either a formal proof or an informal proof) that this argument is valid. If not, explain to us why it is not valid.

   (a) Values are either discoverable properties of things (like colors) or they are conventional products of arbitrary human decisions. But values are obviously not discoverable properties of things. So values must be conventional products of arbitrary human decisions.

   (b) Sensations are either mental or physical. Sensations are mental. Therefore, sensations are not physical.

6. Give a formal proof in the Fitch system:

   (a) Derive S from the premises:
      ¬ H
      ¬ G ∨ H
      (R ∧ G) ∨ (S ∧ A)

   (b) Derive ¬F from the following premises:
      $F \rightarrow [(C \rightarrow C) \rightarrow G]$
      $G \rightarrow [[H \rightarrow (E \rightarrow H)] \rightarrow (K \wedge \neg K)]$

   (c) Without premises prove that P ∨ ¬P.

7. Suppose the following sentences are true.

      (i) ¬[Cube(a) ↔ Small(a)]
      (ii) Cube(a) → Small(a)

   Is ¬[Small(a) → Cube(a)] a logical consequence of these premises? If so, give a formal proof. If not, show us why it is not, by drawing a world. ~(10 pts.)

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