

# Homework 5

Artificial Intelligence I — CS475/CS505

Deadline: March 12, 11:55pm

March 12, 2007

The purpose of this homework are (i) to remind you about the definitions of valid, unsatisfiable, satisfiable sentences; (ii) to practice the use of propositional logic in knowledge representation.

1. Exercise 7.8: Decide whether each of the following sentences is valid, satisfiable, unsatisfiable, or neither. Verify your decisions using truth tables or the equivalence rules of Figures 7.11 (pg 210 - this contains something like  $\alpha \wedge \beta \equiv \beta \wedge \alpha$ )
  - (a)  $Smoke \Rightarrow Smoke$
  - (b)  $Smoke \Rightarrow Fire$
  - (c)  $(Smoke \Rightarrow Fire) \Rightarrow (\neg Smoke \Rightarrow \neg Fire)$
  - (d)  $Smoke \vee Fire \vee \neg Fire$
  - (e)  $((Smoke \wedge Heat) \Rightarrow Fire) \Leftrightarrow ((Smoke \Rightarrow Fire) \vee (Heat \Rightarrow Fire))$
  - (f)  $(Smoke \Rightarrow Fire) \Rightarrow ((Smoke \wedge Heat) \Rightarrow Fire)$
  - (g)  $Big \vee Dumb \vee (Big \Rightarrow Dumb)$
  - (h)  $(Big \wedge Dumb) \vee \neg Dumb$
2. Exercise 7.11: (only part of it) — Consider the Minesweeper game on a board  $10 \times 10$ . Assuming that we write  $C(i, j)$  to denote that there is a mine in the cell  $i$  and  $j$ . Please represent the following information in propositional logic:
  - (a) There exists exactly two mines adjacent to the cell [1,1].
  - (b) There exists exactly two mines adjacent to the cell [2,2].
  - (c) Let KB be the knowledge base consisting of the above two sentences. Show that **it is not possible to derive**  $KB \models \neg C(1, 3)$ .