CSci 5511 Fall 2004

2nd Midterm Exam

Wednesday November 17
75 minutes == 75 points
open book and notes

1. *10 points*
   Two sentences in propositional calculus can be shown to be equivalent by proving that one entails the other and viceversa.

   (a) Prove by contradiction using resolution

   $$\neg(p \wedge q) \models \neg p \vee \neg q$$

   (b) Prove by contradiction using resolution

   $$\neg p \vee \neg q \models \neg(p \wedge q)$$

2. *15 points*
   You are given the following sentence "Heads I win, tails you lose."

   (a) Represent it in propositional calculus using the following propositions $Head$, $Tail$, $IWin$, $YouLose$.

   (b) Suppose that you are told "Head". Prove, using any method you like, that "You lose". To do the proof you might need to represent additional knowledge.

   (c) Suppose that you are now told "Tail". Can you prove that "I do not win"? Do you need any additional knowledge? Comment briefly on your choice of additional knowledge.

3. *10 points*
   Convert the following sentences into a form in which all the quantifiers are as far to the left as possible.

   (a) $\forall x[[\exists y Loves(x,y) \vee Loves(y,x)] \Rightarrow Happy(x)]$

   (b) $\forall x[Happy(x) \Rightarrow [\exists y Loves(x,y)]]$

4. *30 points*
   Write the following sentences in predicate calculus:

   (a) Every city has a dogcatcher who has been bitten by every dog in town.

TURN TO THE NEXT PAGE FOR MORE QUESTIONS

(b) All mushrooms are either purple or poisonous but not both.

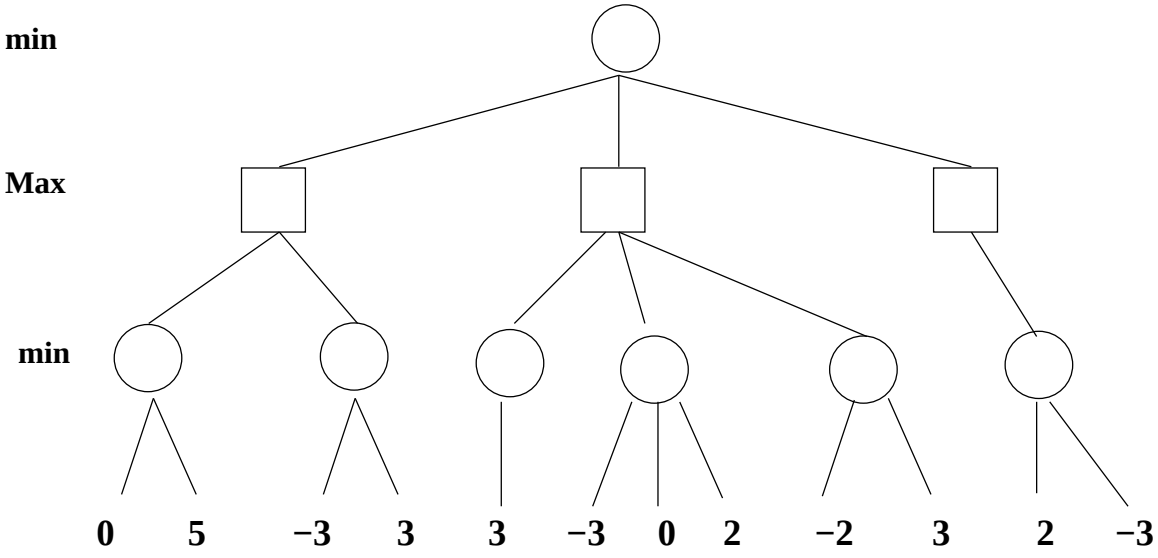
(c) All purple mushrooms except one are poisonous.

(d) Rich people have big houses.

(e) Big houses require work unless they have a house keeper and no garden.

(f) If Bill does not have a big house, Bill is not rich.

5. *10 points*
Show the backed-up values for all the nodes in the following game tree and show the branches that are pruned by alpha-beta. For each branch pruned, explain briefly why alpha-beta prunes it. Follow the convention used in the textbook to examine the branches in the tree from left to right.



YOU REACHED THE END OF THE EXAM