Student ID: _____

Graduate Comprehensive Exam: Artificial Intelligence (Fall 2003)

Answer all questions on the exam. You may use the back for additional space. Total: 100 points. Good Luck.

1. (20 pts) Inference:
   (a) What does it mean for an inference technique to be refutation complete?
   (b) Specify a refutation complete inference rule for First Order Logic knowledge bases.
2. (10 pts) What is a dominant heuristic function for A*?
3. (20 pts) Admissible heuristic
   (a) What strategy do you propose for inventing a good admissible heuristic for a new problem you encounter.
   (b) Explain how you would apply your strategy to the problem of finding the shortest path on a map?
4. (10 pts) Which algorithm between alpha-beta and min-max is expected to be faster for proposing the first move of the second player in tic-tac-toe. Explain.
5. (40 pts) Inference and search:
   (a) What is the difference between forward chaining and backward chaining?
   (b) Devise a first-order-logic example to show that either chaining methods can prove $smart(me)$.
   (c) Discuss in what situations would you choose backward chaining method over forward chaining, **and** vice versa.
   (d) Consider backward chaining as a search problem:
      i. what are the initial state, goal test, and operators?
      ii. given the choice of breadth-first search or depth-first search, explain which search method is preferred.