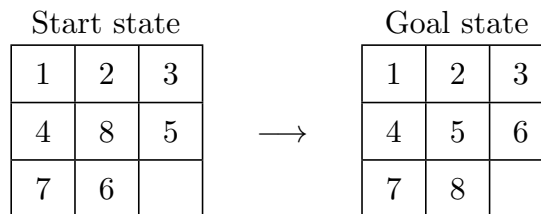


2009 Paper 4 Question 3

Artificial Intelligence I

- (a) Explain the difference between *uninformed* and *informed* search. List *two* examples of each type of algorithm. [2 marks]
- (b) In the context of planning, describe what a *heuristic* is and what it means for it to be *admissible*. List *two* examples of typical heuristic functions. [Hint: consider the problem in part (d) below.] [2 marks]
- (c) Explain what A* search is, including the advantages and disadvantages with respect to its theoretical properties. [3 marks]
- (d) Draw a search tree for the 8-puzzle problem up to depth 4 (start state is depth 0) using the A* algorithm (omit repeated states) with the evaluation function $f(n) = p(n) + h(n)$, where $p(n)$ is the number of steps from the start state (start state is step 0) and $h(n)$ is the number of misplaced tiles. Note that the actions for sliding tiles should be used in this order: right, left, up and down. Write the values of f and of its components p and h under each state. You may use an abbreviated notation indicating only the tiles that change. [10 marks]



- (e) Briefly explain IDA* search and its advantages and disadvantages. What happens when using IDA* in the search problem in part (d) if the IDA* limit is 3? What happens if the limit is 4 (in terms of number of states)? [3 marks]