CSCE625: Artificial Intelligence
Sample Midterm Exam Questions

Question 1: Heuristics (15 points)

Consider heuristics where $h(n) = 0$ for all n for which $\text{GOAL}(n) = \text{True}$, i.e., functions that have the value zero for states that are goals. Then the following statements are either true or false

Statement 1: Every admissible heuristic is consistent.

Statement 2: Every consistent heuristic is admissible.

For each statement: (1) identify whether it is true or false. (2) If it is true prove that it is so; otherwise, if it is false, provide a counterexample.

> *Reminder:* Using the notation from the textbook, with n' a successor of state n and a an action, a consistent heuristic is required to have $h(n) \leq c(n, a, n') + h(n')$.

Question 2: Search costs (6 points)

You are approached by a client who arranges cycling tour holidays of Romania; they are interested in a specialized routing problem on their map, which they want to treat via search on a graph. Usually when one looks for a route to drive from one place (say Arad) to another (say Bucharest), the quantity being minimized is the total distance. If the route goes from A to S, on to F, then arrives at B, the total distance is the sum of distances on the roads along the path (i.e., $\text{dist}(A, S) + \text{dist}(S, F) + \text{dist}(F, B)$). But your client is thinking about how grueling a route will be, so they have boiled their problem down to minimizing of either:

1. the mean distance between stops (e.g., $\frac{1}{3}\left[\text{dist}(A, S) + \text{dist}(S, F) + \text{dist}(F, B)\right]$) or,
2. the maximal leg distance (e.g., $\max[\text{dist}(A, S), \text{dist}(S, F), \text{dist}(F, B)]$).

Assuming that you want to use uniform cost search, what do you advise them? Why? Argue about the metrics w.r.t. the algorithm, not which is a better model of bicycling route difficulty.