# ECS 170 Homework 2

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1. Given a set of admissible heuristics $\mathcal{H} = \{h_1, h_2, ..., h_n\}$ one can define a new heuristic $h_{max}$ such that for any node $n$:

$$h_{max}(n) = \max_i h_i(n)$$

   (a) Show that $h_{max}$ is an admissible heuristic.

   *Proof.* Assume $h_{max}$ is not an admissible heuristic.
   We know $h_{max}$ is some heuristic from the set $h_1, h_2, ..., h_n$. This means some heuristic in $\mathcal{H}$ is not admissible.
   This is a contradiction since $\mathcal{H}$ contains only admissible heuristics, thus our assumption was incorrect.
   Therefore, $h_{max}$ is an admissible heuristic. □

   (b) Show that $h_{max}$ dominates all other $h_i$

   *Proof.* Assume $h_{max}$ does not dominate all other $h_i$.
   Then there must be some heuristic $h_j$ in $\mathcal{H}$ such that $h_{max}(n) < h_j(n)$. But we know that $\forall i, 1 \leq i \leq n, h_{max}(n) \geq h_i(n)$.
   This is a contradiction, thus our assumption was incorrect.
   Therefore, $h_{max}$ dominates all other $h_i$. □