1. **Prove each of the following statements, or give a counterexample:**

   a. Greedy best-first tree search is optimal and complete in finite space.

   b. Breadth-first search is a special case of uniform-cost search.

   c. Depth-first search is a special case of best-first tree search.

   d. Uniform-cost search is a special case of A^* search.

2. **Assuming predicates Parent(p, q) and Female(p) and constants Joan and Kevin, with the obvious meanings, express each of the following sentences in first-order logic. (You may use the abbreviation ∃1 to mean "there exists exactly one.")**

   a. Joan has a daughter (possibly more than one, and possibly sons as well).
   b. Joan has exactly one daughter (but may have sons as well).
   c. Joan has exactly one child, a daughter.
   d. Joan and Kevin have exactly one child together.
   e. Joan has at least one child with Kevin, and no children with anyone else.