Name: _____

1. (1 pt.)
   - **Read all material carefully.**
   - Budget your time: 30 minutes, 30 pts ⇒ 1 min./pt. avg.
   - You may refer to your books, papers, and notes during this test.
   - No computer or network access of any kind is allowed (or needed).
   - Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
   - Use the conventions used in class and the textbook for notation, algorithmic options, etc.
   - There is one extra-credit question at the end. It is marked with a ⋆ and is harder than the rest.

   Write your name in the space provided above.

2. (5 pts.) Prove or disprove: for all reals $p, q > 18$ and all functions f that map reals to reals, if f is $\Omega(\log_p n)$ then f must also be $\Omega(\log_q n)$.

3. (5 pts.) Depict (using the usual graphical representation) the binary search tree (plain, not balanced) resulting from the insertion of the following keys, in the order presented. Depict the final tree only. (See also Q. 5.)

$$33, 54, 75, 37, 12, 8, 98, 26$$

4. (3 pts.) List the nodes of the tree of Question 3 in

   preorder:

   postorder:

   inorder:

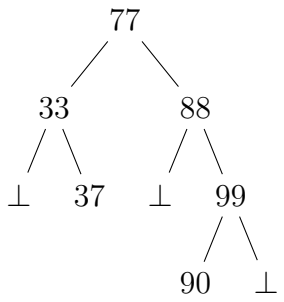
   level-order:

5. (3 pts.) Annotate each node in the tree of Question 3 by writing its *depth* to the left of the node and *height* to the right.

6. (8 pts.) Depict the trees resulting from the deletion of each of the following keys (in given order) from the tree of Question 3. Depict the tree after each deletion.

$$75, 33, 26, 37$$

7. (5 pts.) Provide a sequence of keys that produces the following binary search tree when the keys are inserted into an initially empty tree in sequence order.



8. (5 $\star$ pts.) How many distinct sequences satisfy the requirement of Q. 7? Justify your answer.