CSE 311: Foundations of Computing I
Assignment #6
May 4, 2012
due: Monday, May 14, 1:30 p.m.

Textbook numbering labeled “6th edition” refers to the textbook’s Sixth Edition.
Numbering that is unlabeled refers to the Seventh Edition.

1. Definition 4 in Section 5.3 [6th edition: Definition 5 in Section 4.3] defines an extended binary tree. If T_1 and T_2 are both empty, $T_1 \cdot T_2$ is called a *leaf*. For example, the last tree in Figure 3 of Section 5.3 [6th edition: Section 4.3] has 2 leaves and the next to last tree in that figure has 3 leaves. The *height* of an extended binary tree is the distance from the root to the farthest leaf. All the trees in Step 3 of Figure 3 have height 2. (Note that the height is considered to be 2 rather than 3: it’s the number of edges on the longest root-to-leaf path rather than the number of nodes.) By induction, prove that for any positive integer n, any extended binary tree with n leaves has height at least $\log_2 n$. Be careful of the possibility that your tree has one empty subtree and one nonempty subtree. (Hint: it will be simplest if your induction mirrors the recursive definition given in Definition 4 [6th edition: Definition 5].)

2. Section 9.5 [6th edition: Section 8.5], exercise 16.

3. Section 9.5 [6th edition: Section 8.5], exercise 40. The answer to part (b) should show that there is a one-to-one correspondence between the equivalence classes of R and the elements of a very familiar mathematical set.

4. Page 635 [6th edition: Page 584], Supplementary Exercise 10. (“A relation R is called circular ...”)