Homework 1

The assignment is to implement the data structures described on Handout 3. Submit your source code. Specifically, include:

1. Class `Tree` with attributes `cat`, `word`, and `children`

2. Method `__str__()` of `Tree`, which pretty-prints the tree with indentation

3. Functions `isleaf()` and `isinterior()`

4. Function `parse_tree()`

5. Function `terminal_string()`

6. Class `Index` with methods `__getitem__()` and `add()`

7. Class `Lexicon` with method `__init__()` that reads the lexicon from a file

8. Methods `parts()` and `words()` of `Lexicon`

9. Class `Rule` with attributes `lhs` and `rhs` and method `__repr__()`

10. Class `Grammar` with attributes `start` and `lexicon` and method `isterm()`

11. Method `__init__()` of `Grammar`, which reads the grammar from a file

12. Methods `expansions()` and `continuations()` of `Grammar`

13. Method `generate()` of `Grammar`

Both correctness and clarity are important. Be sure to comment on anything that is non-obvious or that goes beyond what was on the handouts.

Also, show the output for each of the following tests:

14. Read in `t0.txt` as a tree. Print out the terminal string, followed by a pretty-printed version of the tree.

15. Read in `g0.g` + `g0.lex` as a grammar + lexicon. Pass "N" and "V" to the lexicon's `words()` method and print out the results for each.

16. Pass "book" and "I" to the lexicon's `parts()` method and print out the results for each.

17. Pass "NP" and "VP" to the grammar's `expansions()` method and print out the results for each.

18. Pass "N" and "V" to the grammar's `continuations()` method and print out the results for each.

19. Call the grammar's `generate()` method and print out the results.

You should include three files in your submission: your source file, the test file (source code), and the test file output. The test file output should be just as it is produced; do not manually edit it.