

---

## GP - GEB Problem Set: Recursion, RTN's, and More!

---

---

**Name:** Jordan Bailey

**Abstract:** This is a problem set that is based primarily on Chapter 5 of Hofstadter's GEB. Just a bit of Chapter 7 comes into play, as well.

---

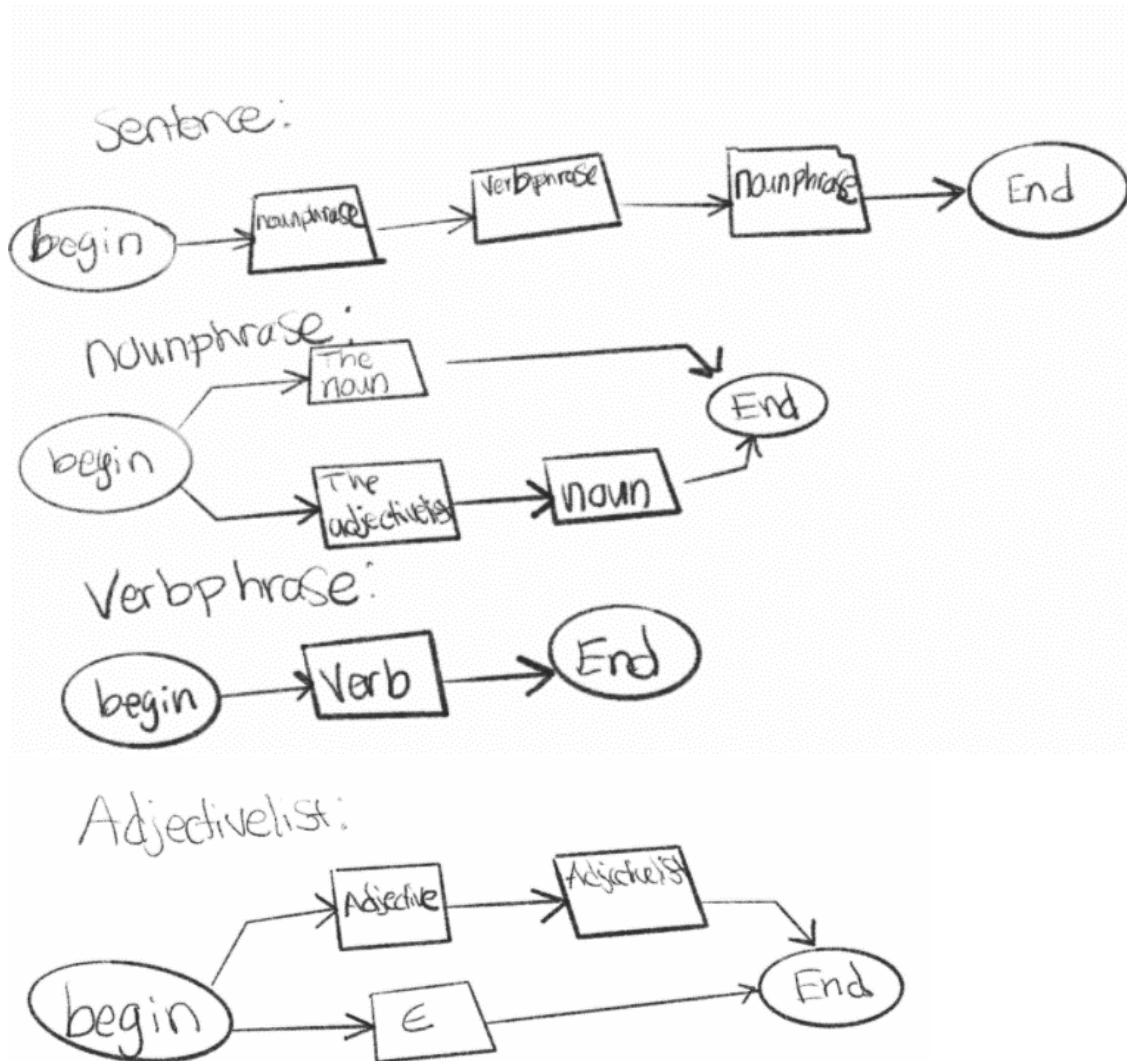
### Tasks

---

1. Hofstadter writes about recursion in a very informal way in the first three sections of Chapter 5. Please write down five easily articulable ideas about recursion that he expresses in those sections of this chapter, ideas that resonate with you in a meaningful way.
  - a. **A recursive definition never defines something in terms of itself, but always in terms of simpler versions of itself.**
  - b. **To push means to suspend operations on the task you're currently working on, without forgetting where you are-and to take up a new task.**
  - c. **To pop is the reverse-it means to close operations on one level, and to resume operations exactly where you left off, one level higher.**
  - d. **So, a stack is just a table telling you such things as (1) where you were in each unfinished task, (2) what the relevant facts to know were at the points of interruption**
  - e. **We hear music recursively-in particular, that we maintain a mental stack of keys, and that each new modulation pushes a new key onto the stack.**
2. In a paragraph or two, without providing any explicit examples, describe "recursive transition networks". Please say something about (1) what they are used for, (2) what elements they are composed of, and (3) their relationship to context free grammars.

**Recursive Transition Networks are used for showing paths to be followed in particular paths. Each path has a number of nodes (boxes with words in them) joined by arcs (lines with arrows). The first and last nodes have the words *begin* and *end* in them, while all other nodes contain either short directions to perform, or names of other RTN's. You can create RTN's that define particular CFGs.**

3. Faithfully mimicking Hofstadter's representation of RTNs, draw a set of recursive transition networks which defines the "English Like Language" that was featured in the CFG/CFG assignment. That is, draw a set of recursive transitions that correspond in a faithful manner to the CFG provided for the "English Like Language".



4. Please read the first page and a half of Chapter 7 "The Propositional Calculus". Draw a set of recursive transition networks for Hofstadter's particular variant of WFFs, as presented in the first page and a half of Chapter 7.

5. (a) Draw Diagram S yourself. (b) Draw Diagram S, once expanded. (c) Draw Diagram S, twice expanded.

