# GP - GEB Problem Set: Recursion, RTNs, and More!

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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.

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.

1) Recursion is not defined as a paradox but are often used in conjunction.

2) Recursive definition: May give the viewer the impression that something is being defined in terms of itself (simpler versions).

3) Recursion can be seen as nesting and variations of nesting.

4) An example of recursion is Russian dolls inside Russian dolls.

5) Another example can be seen in dialogue.

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 (RTN) are designed to recursively show the options available towards accomplishing a task. In RTN, there are nodes that are represented with boxes that contain words and arcs which are represented by arrows. There are also start and end nodes that are represented with "begin" and "end". RTN core elements are like context free grammars because both have rules towards production. The arcs between the boxes represent a transition from one state to another.

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"
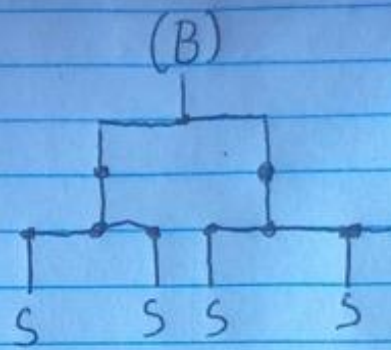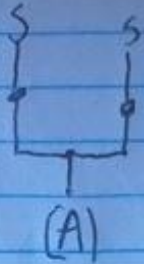
(a)

My English:

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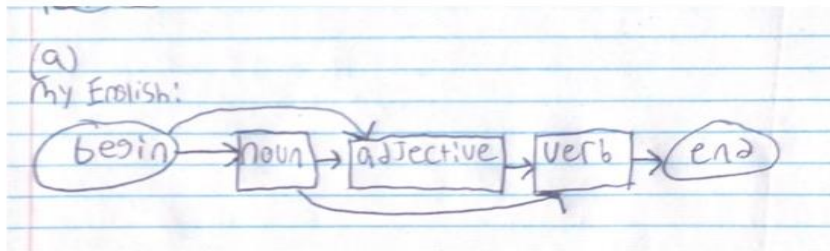
4. Please read the first page and a half of Chapter 7 "The Propositional Calculus". Draw a set of recursive transition networks for Hofstadter's particular variant of WFFs, as presented in the first page and a half of Chapter 7

4.

begin → ⌐∧egation → ∧(And) → v(or) → (subset) → end

begin → {P, q, R} → P∨q∨R → end
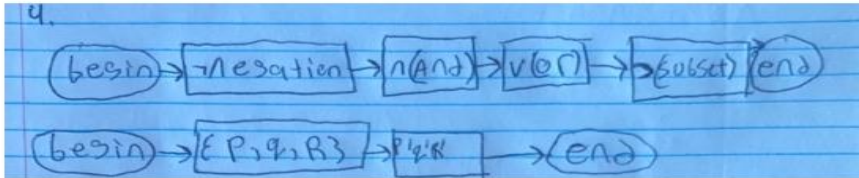
5. Consider Diagram S shown below, which I constructed in the spirit of Diagram G and Diagram H that Hofstadter presented in the chapter.

 (a) Draw Diagram S yourself.

(b) Draw Diagram S, once expanded.

(c) Draw Diagram S, twice expanded.

5.

(A)

(B)

(C)