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1. Write down the axiom schema and the three shortest axioms in the tq- system.

Schema: xt-qx is an axiom, whenever x is a hyphen-string. -t-q-, --t-q--,-t--q--

2. Write down the sole rule of inference for the tq- system and apply it to the well-formed string: -----t-----q-----.

Rule of inference:Suppose that x,y, and z are all hyphen-strings. And suppose that xtyqz is an old theorem. Then, xty-qzx is a new theorem.
-----t-----q----- -> -----t------q------.

3. Reasoning in I-mode, argue that the string you produced in the previous item is not a theorem in the tq- system.

The previous item is not a theorem in the tq- system as it does not follow the properties of multiplication that the tq-system does.

4. Working in M-mode, show that -----t---q---------- is a therem in the tq- system.

It is a theorem, because 5x3 equals 15, as shown in this theorem.

5. What are the two rules of the C- system?

Suppose x, y, and z are hyphen-strings. If x-ty-qz is a theorem, then Cz is a theorem.

Suppose x is a hyphen-string if Cox is not a theorem, then Px is a theorem.

6. Working within the C- system, argue that C-------- is a theorem of the system.

C--------is a theorem of the system because it is composite, the value being 8.

7. Does adding the following rule to the C- system constitute a Post production system for determining primes?

• Suppose x is a hyphen-string. If Cx is not a theorem, then Px is a theorem. Please explain your rewponse.

It does not, because it's not a typographic operation.

8. First, please consider the following image of a quiche pan:

Second, recall that Hofstadter writes the following about positive space and negative space::

When a figure or “positive space” (e.g., a human form, or a letter, or a still life) is drawn inside a frame, an unavoidable consequence is that its complementary shape - also called the “ground”, or “backgraound”, or “negative space” - has also been drawn.

According to this view, the quiche pan shown above, that I computationally rendered, would be considered negative space. Explain how this is so. That is, explain how I rendered this image so that the quiche pan may be considered negative space rather than positive space, which would be the normal human interpretation of the image.

Because it is drawn on black surface with white , the black could also be considered markings.

9. Consider the A- system as defined by the following axiom and rule: • Axiom: A--

• Rule: Suppose that x is a hyphen-string. If Ax is a theorem, so is Ax--. Please answer the following questions with respect to the A-system:

(a) Show that A-------- is a theorem of the A- system by working within the system.

A-- -> A---- -> A------ -> A--------

(b) Specify a decision procedure for determining theoremhood in the A- system.

If the ammount of hyphens are able to be devised by two, then it is a theorem.

(c) Provide an I-mode argument that the string A---------- is not a theorem of the A- system.

The string is not a theorem because the amount of hyphens after a are odd.

(d) What subset of the natural numbers do you think it was my intent to capture with the A- system?

Even numbers.

10. Consider the as yet to be formally defined B- system which you should imagine is intended to capture precisely all of the natural numbers that the A- System does not capture.

(a) Propose, by analogy with the rule on page 66 of GEB, an invalid rule for producing theorems in the B-system.

(b) Define a (valid) Post produduction system for the B- system in terms of one axiom and one rule.

Suppose x is a string. If Bx is a theorem, so is Bx-

(c) Derive B---------- within the B- system.

B- -> B--- -> B----- -> B------- -> B--------- -> B----------

(d) What subset of the natural numbers does the B- system capture?

odd

11. Under interpretation, what does the A- system theorem A-------- say? Under interpretation, what does the B- system theorem B---------- say?

8 is a even, 11 is odd.

12. According to Hofstadter, what does it mean for a set to be “recursively enumerable”? What does it mean for a set to be “recursive”?
It cane be generated due to typographical rules. It can be generated by negation.

13. Argue that the set of even numbers is recursively enumerable.

To need to add 2 to a 0 value to make it even.

14. Argue that the set of even numbers is recursive.

Add 2 to a value of 1 to make it odd, whatever isn't generated by that rule is even.

15. Argue that the set of prime numbers is recursively enumerable.

The C- system proves this.

16. Argue that the set of prime numbers is recursive.

If you generate composite numbers, whatever is not composite is prime.

17. In a sentence or two, explain why you think that I am not asking you in this problem set to derive something like P----- within the P- system?

It is too long and time consuming.