2018年8月5日 星期日

# Discrete Math 2018

# problem set 1

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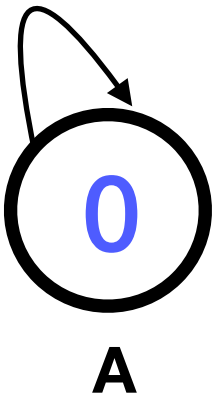
1. Let S denote a single-valued “successor” function. The following axioms define the arithmetical properties of the natural numbers.

   ① For every natural number *n*, *S*(*n*) is a natural number.

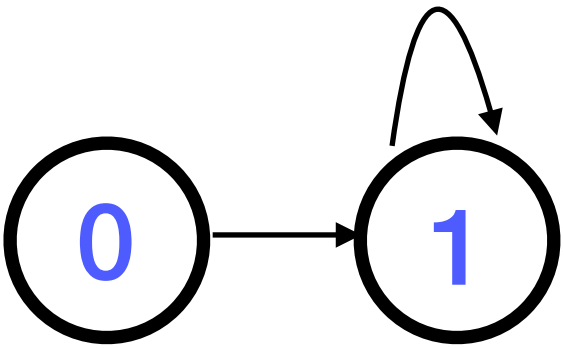
   ② For all natural numbers *m* and *n*, *m* = *n* if and only if *S*(*m*) = *S*(*n*). That is, *S* is an injection.

   ③ For every natural number *n*, *S*(*n*) = 0 is false. That is, there is no natural number whose successor is 0.

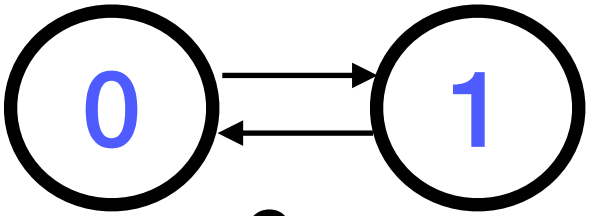
   A. In the following diagram, S(m)=n, if a directed edge connects node m to node n. State why each of the following model is invalid.



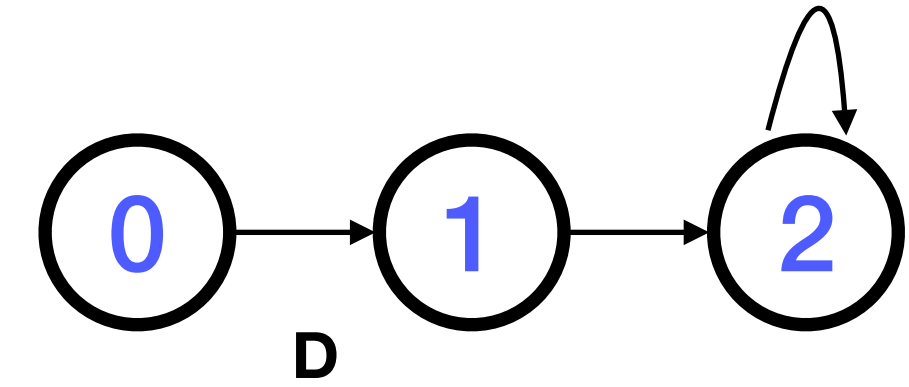

A



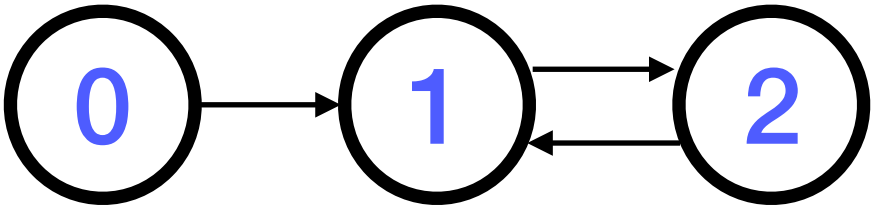

B




C




D




E

B. Try to draw a model that is valid under the three axioms.

2. True tables
   A. NOT p
   B. p AND q
   C. p XOR q
   D. p OR q
   E. p implies q
   F. p if and only if q
3. Show that ~(p ⊕ q) ≡ $p \leftrightarrow q$ using truth table
4. Show that $\sim p \vee q \equiv p \rightarrow q$