187 §3- DISCRETE MATHEMATICS - Quiz 4

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Name _____

1. (a) Explain why if we assume p and $p \Rightarrow q$ then we can conclude q.
   (b) Explain why, in order to prove a statement of the form $A \Rightarrow B$, it suffices to assume A, and somehow conclude B.
   (c) Recall that a tautology is a propositional statement that is always true. Use parts (a) and (b) above to show that the following is a tautology:
   $$(p \Rightarrow q) \Longrightarrow ((q \Rightarrow r) \Longrightarrow (p \Rightarrow r)).$$

2. The sequence of *Fibonacci numbers*
   $$1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, \ldots$$
   is obtained as follows: We start with 1 and 1. After that, each new number on the list is the sum of the previous 2:
   $$2 = 1 + 1, \quad 3 = 2 + 1, \quad 5 = 3 + 2, \quad 8 = 5 + 3, \quad 13 = 8 + 5, \ldots$$
   Consider the following decision problem:

   Given a number n, is n a Fibonacci number?

   Describe an algorithm that solves this problem. Explain why your algorithm gives the right answer.