Rajat Sethi – CPSC 3500 – Assignment 12

1. The TM will check every character in the string only once a run-time of O(n).
   1. If the string length is not three, then it rejects and halts.
   2. If any character does not match the previous one, then it will also reject and halt.
   3. Else, the TM will accept and halt.
2. For every implication, find its contrapositive and add it to the list of implications. Then, for every literal, check all of the paths that the implications go through. For example,  
     
   A 🡪 B  
   B 🡪 C  
   C 🡪 D  
     
   Has a path that looks like  
     
   A 🡪 B 🡪 C 🡪 D  
     
   If there exists a path that contains a literal first and its negation second, and another path that contains its negation first and literal second, then the list is unsatisfiable. For example,  
     
   X 🡪 A  
   A 🡪 -X  
   -X 🡪 B  
   B 🡪 X  
     
   Would create two paths  
   X 🡪 A 🡪 -X  
   -X 🡪 B 🡪 X  
     
   Since we have an X 🡪 -X and another -X 🡪 X, this list is unsatisfiable. The run-time for this algorithm should be polynomial, O(n^2).
3. If P = NP, then the Clique Problem itself becomes P. Let T be the time-complexity of the “P” Clique Algorithm. To find the maximum clique, run the “P” Clique Algorithm for every size from 0 vertices to n vertices. The run-time for this Maximum Clique Algorithm will be O(T \* n).
4. Yes