1. Draw a TM that converts from unary to binary. That is, if the input is \(k\), it leaves \(k\) in binary on the tape.

2. Consider a TM as usual, except that the tape starts with exactly one non-blank cell, but the tape head can start anywhere. Describe in English a TM that finds the non-blank cell.

3. Define a twice-change Turing Machine (TCTM) as one that can alter each tape cell at most twice. Show that a TCTM has the same power as a standard TM.

4. Give an algorithm to determine on an input RE whether that RE generates at least one string containing 000. Discuss the running time of your algorithm.

5. Show that it is decidable to determine, given an NFA, whether there exists a string that the NFA accepts along two different paths.

6. Show that the language \(\{\langle G \rangle : G \text{ is a CFG that accepts at least } 100 \text{ strings} \}\) is decidable.

Due: Tuesday November 3