1. For unary input, draw a TM that computes the parity. That is, it leaves one symbol if the input length is odd, and zero symbols otherwise.

2. Consider the following TM.

(a) If the input string is 10101, what is the final configuration of the TM?
(b) Does this TM halt on all strings?
(c) What exactly does this TM do to the string on the input tape? (Hint: consider the string as a binary number.)

3. Describe in English the program for a TM that halts if and only if the tape contains a nonempty cell. In this question the head can start anywhere on the tape.

4. 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.

5. Which of the following is FALSE?
   (a) A quine is a program that produces a copy of its own source code as its only output
   (b) In Escher’s lithograph “Drawing Hands”, the hands are drawing each other
   (c) Kurt Gödel received his Ph.D. at Princeton
   (d) “Squeamish Ossifrage” was encoded as part of an RSA challenge

6. Which of the following is an example of self-reference?
   (a) Rene Magritte’s painting that is not a pipe.
   (b) The Epimenides Paradox
   (c) GNU
   (d) All four answers

Due: Thursday November 3