

## CS138 Section Week 9

May 27, 2016

**1.** Let  $\Sigma = \{1\}$  be the input alphabet. Describe (in words) a Turing Machine that accepts if and only if the number of 1's in the input is a prime number.

**2.** Describe (in words) a Turing Machine that accepts the language  $\{ww \mid w \in \{a, b\}^*\}$ .

**3.** Suppose that we have a Turing machine  $M$ . Describe a Turing Machine  $M'$  that accepts the input  $\langle M \rangle$  (an encoding of  $M$ ) if and only if there is some input  $x$  that is accepted by  $M$  (i.e.  $M(x)$  terminates and accepts). You can assume that, given an encoding of a TM, you have a Turing Machine “algorithm” that simulates running  $M$  on any input of your choice.