## Week 5 Tutorial Session

- 1. For an integer  $k \ge 1$ , define  $L_k$  to be the set of strings (over  $\Sigma = \{0, 1\}$ ) that have a 1 at the kth-to-last position. For example, **1**00 and 0**1**01 are in  $L_3$ , but 0 and 011 are not.
  - (a) Prove that every DFA for  $L_k$  has at least  $2^k$  states.
  - (b) Describe (e.g. with a diagram) an NFA for  $L_k$  that has at most k+1 states.
- 2. Let L be the set of strings over  $\{0,1\}$  whose number of ones is a perfect square (e.g.  $0,1,4,9,16,\ldots$ ). Prove that L is irregular.