Assignment 2 | **SE4I03 Fall 2002** | **due on Oct. 4**

1. Construct a DFA accepting the language $L(R)$, where R is the regular expression given by $(11 + 110)^*0$. Present your solution in diagram form.

2. Show that the following language is not regular:

$$L_1 = \{0^i x | i \geq 0, x \in \{0,1\}^* \text{ and } |x| \leq i\}$$

3. Prove the following weaker form of the Pumping Lemma:

   Theorem 1 (Weaker form of the Pumping Lemma): Suppose L is an infinite regular language. There are integers p and q, with $q > 0$, so that for every $m \geq 0$, L contains a string of length $p + mq$. In other words, the set of integers $\{|x| | x \in L\}$ contains an "arithmetic progression" of all integers $p + mq$, $m \geq 0$.

4. Use Theorem 1 to show that the following language is not regular:

$$L_2 = \{0^n | \ n \text{ is prime } \}$$