

## CSE 311: Foundations of Computing

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### Irregularity Proof Template

To prove that a language  $L$  is irregular, fill in the missing “...” parts below:

To show a contradiction, suppose that  $L$  is regular. Then, there exists a DFA  $M$  that recognizes  $L$ .

Let  $S = \dots$ . Since  $S$  is infinite and  $M$  has finitely many states, there must be two different strings  $\dots$  and  $\dots$  from  $S$  that are taken to the same state by  $M$ .

Consider appending  $\dots$  to both strings. Note that  $\dots \in L$  but  $\dots \notin L$ . However, since  $\dots$  and  $\dots$  are taken to the same state by  $M$ ,  $\dots$  and  $\dots$  are also taken to the same state since the rest of the characters are the same. Call this last state  $q$ . Whether  $q$  is an accepting state or a rejecting state, it makes a mistake on one of these two strings. This shows that  $M$  does not recognize  $L$ , contradicting our earlier assumption that it did.

Hence, our assumption that  $L$  was regular must have been false.