CS 374 Spring 2018
Homework 3

Nathaniel Murphy (njmurph3)
Tanvi Modi (tmodi3)
Marianne Huang (mhuang46)

Problem 3 Solution:

1. $L = \{xx^R w \mid w, x \in \{0,1\}^+\}$

Consider a fooling set $F = \{0^n 1 \mid n > 0\}$
Let $u, v \in F$ where $u \neq v$
Let $u = 010^i 1$, $i > 0$
Let $v = 010^j 1$, $j > 0$
Distinguishing suffix $w = 10^i 10w$, $i > 0, w = 1$
$uw = 010^i 110^i 101 \in L$
$vw = 010^j 110^i 101 \notin L$
Notice that vw cannot be in L because no matter what part of the string we decide to start w at, the only way to achieve xx^R would be to have $i = j$ and $w = 1$.
F is a fooling set and $|F| = \infty$, therefore L is irregular.

2. $L = \{0^i 1^j 0^{ij} \mid i, j > 0\}$

Consider a fooling set $F = \{0^m 1^n 0^{mn} \mid m, n > 0\}$
Let $u, v \in F$ where $u \neq v$
Let $u = 0^m 1^m$
Let $v = 0^m 1^n$
Distinguishing suffix $w = 0^{mm}$
$uw = 0^m 1^m 0^{mm} \in L$
$vw = 0^m 1^n 0^{mm} \notin L$
F is a fooling set and $|F| = \infty$, therefore L is irregular.