

21-301 Combinatorics  
Homework 5  
Due: Wednesday, October 14

1. Use the pigeon-hole principle to show that for every integer  $k \geq 1$  and prime  $p \neq 2, 5$  there exists a power of  $p$  that ends with  $000 \cdots 0001$  ( $k$  0's).
2. Suppose that we two-color the edges of  $K_6$  Red and Blue. Show that there are at least two monochromatic triangles.
3. Show that  $r(C_4, C_4) = 6$  where  $C_4$  denotes a cycle of length four.