

Extra questions for assignment 4

1. Suppose that  $q = p^n$  and  $p_1, \dots, p_r$  are the distinct prime factors of  $q - 1$ . Show that  $g$  is a multiplicative generator of  $F_q$  if and only if  $g^{\frac{q-1}{p_i}} \neq 1$  in  $F_q$  for all  $i = 1, \dots, r$ .
2. Use the previous question to determine which of the numbers 2, 3, 5, 7 are generators of  $F_{41}$ .
3. Assume that  $g$  is a generator of  $F_q$ . Show that  $g^i$  is a generator if and only if  $i$  and  $q - 1$  are relatively prime.
4. In  $F_{101}$ ,  $L_2(3) = 69$  and  $L_2(5) = 24$ . Compute  $L_2(60)$ .