

Exercise Set 6:  
**Quadratic Reciprocity**

Math 414, Winter 2010, University of Washington

Due Wednesday, February 17, 2010

This homework assignment is purposely short because you also will have a take-home midterm this coming weekend.

1. Let  $p \neq 7$  be an odd prime. Use the quadratic reciprocity law to prove that  $-7$  is a perfect square modulo  $p$  if and only if  $p \equiv 1, 2, 4 \pmod{7}$ .
2. Let  $\zeta_p$  be a primitive  $p$ th root of unity. Are there infinitely many primes  $p$  such that the Gauss sum  $\sum_{n=0}^{p-1} \binom{n}{p} \zeta_p^n$  is a real number?