NUMBER THEORY HW 4: DUE TUESDAY, DECEMBER 4, 2018

Question 1. *Find a primitive root of* 23.

Question 2. *show that* $3^8 \equiv -1 \mod 17$. *Explain why this implies that* 3 *implies that* 3 *is a primitive power modulo* 17.

Question 3. *Let* p *be an odd prime and let* g *and* h *be primitive powers modulo* p. *Show that* gh *is not a primitive power modulo* p.

Question 4. *Show that* 3 *is a quadratic residue modulo* 13 *but not modulo* 7.

Question 5. *Let* p *and* q *be odd primes with* $q \equiv 1 \mod 4$. *If* p *is a quadratic residue modulo* q, *show that* q *is a quadratic residue modulo* p.