

# Number Theory Homework #7

**Prof. Zeev Rudnick**

To be handed in by Monday, December 19, 2011.

---

1. Use Euler's criterion to determine which of the following congruences is solvable:  $x^2 = 2 \pmod{41}$ ,  $x^2 = 2 \pmod{43}$ .
2. Show that the congruence  $x^3 = a \pmod{173}$  has solutions for all  $a$ .  
(A computer printout is not acceptable here!)
3. Show that if  $n > 2$  then  $\varphi(n)$  is even.
4. Show that if  $m > 2$ ,  $n > 2$  are coprime integers then there is no primitive root modulo  $mn$ .