

CS 2800: Discrete Structures

Homework 8

Due Monday, October 29, 2012

Please write your netid in sufficiently large font on the upper right corner of all pages. Grading for all problems will be based on neatness, style, and correctness.

1. The Euler $\Phi(n)$ function is defined to be the number of integers less than n that are relatively prime to n .
 - (a) What is $\Phi(17)$?
 - (b) What is $\Phi(21)$?
2. Use the RSA encryption to encrypt the message $m = 17$. Select primes 7 and 11 for your system. Decode the message and make sure that your system works.
3. Find a ten digit prime, or at least a 10 digit number that is likely to be a prime. By likely we mean it is a prime with probability greater than $1/128$. You can assume your number is not a pseudo prime although it might be. Use Matlab or some other program and simply give us your program. If you do not have access to a convenient programming language simply describe how you would do it.
4. Compute $3^{100} \pmod{7}$. Write out all steps in your calculation.
5. Consider doing arithmetic modulo primes 7, 11, and 19. Use the Chinese remainder theorem to find the number whose representation is (3,1,10).