

Homework 5, due September 18

- (1) Find all solutions modulo 17, 97, and 105, respectively, to the congruences  $5x + 3 \equiv 9 \pmod{17}$ ,  $18y - 23 \equiv 5 \pmod{97}$ , and  $14x + 3 \equiv 10 \pmod{105}$ . Show your work.
- (2) Let  $a$  be a positive integer with  $\gcd(a, 26) = 1$ . Suppose  $A = 0, B = 1, C = 2$ , etc. Why will the function  $x \mapsto ax^2 \pmod{26}$  not work as a cipher system? For example, if  $a = 11$ , then  $C = 2 \mapsto 11 \cdot 2^2 \equiv 18 \pmod{26} = S$ .
- (3) For the following ciphertext, the first part was encrypted by a shift cipher. Decrypt both parts.

DROXOHDMSZROBSCKPPSXODROPSBCDDGYVODDOBCKBOIY  
VJLKNATDXKHTHAXAPIHTYTHJHCHTNIRJTFCFKCNHAI V FJKKXFC