

Homework 5, MORALLY AND REALLY Due Mar 3

I WANT TO POST SOLUTIONS TO THIS ON TUESDAY AFTER CLASS TO HELP YOU STUDY FOR THE MIDTERM, SO THIS IS REALLY DUE TUESDAY.

READ MY NOTES ON THE COURSE HOMEPAGE ON CIPHERS—JUST THE SHIFT AND AFFINE CIPHERS PART.

THE FIRST REAL PROBLEM REQUIRES EITHER READING MY NOTES OR HEARING MY LECTURE ON THURSDAY. THE REST YOU ALREADY KNOW HOW TO DO AND SHOULD GET AN EARLY START ON.

1. (0 points but you have to answer) What is your name? Write it clearly. Staple your HW.
2. (THIS PROBLEM YOU WILL KNOW HOW TO EITHER FROM READING THE NOTES OR FROM MY LECTURE THURSDAY.) (25 points) Martians have a 15 letter alphabet.
 - (a) How many shift ciphers can they have?
 - (b) How many affine ciphers can they have?
3. (25 points)
 - (a) Use the Euclidean algorithm to find the inverse of $81 \bmod 100$. Show all work.
 - (b) As you know, there is NO inverse of $45 \bmod 100$. Even so, use the Euclidean algorithm on this problem and show all work. What can you conclude from what you get?
4. (25 points)
 - (a) Compute $3^{81} \pmod{101}$.
 - (b) Compute $7^{1000000000000000} \pmod{101}$.