Assignment 3

3.1

$\det K = 99 - 96 = 3$

$K = \begin{pmatrix} 11 & 8 \\ 12 & 9 \end{pmatrix}$ $\gcd(3, 26) = 1$ ✓

Plaintext = "Hello"

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

hello
7 4 11 11 14

H E
$(7,4)\begin{pmatrix} 11 & 8 \\ 12 & 9 \end{pmatrix} = (77+48, 56+36) = (125, 92$
$= (21, 14)$

L L
$(11\ 11)\begin{pmatrix} 11 & 8 \\ 12 & 9 \end{pmatrix} = (121+132, 88+99) = (253, 187$
$= (19, 5)$

O A
$(14\ 0)\begin{pmatrix} 11 & 8 \\ 12 & 9 \end{pmatrix} = (154, 32) = (24, 8)$

V O T F Y I

Cyphertext = (21,14) (19,5) (24, 8)

"VOTFYI"

Question on matrix multiplication.

3.2

$K = \begin{pmatrix} 11 & 8 \\ 3 & 7 \end{pmatrix}$ $\begin{vmatrix} 11 & 8 \\ 3 & 7 \end{vmatrix} = 77 - 24 = 53$

Ciphertext = „xiyj"

$K^{-1} = (53)^{-1} \begin{pmatrix} 7 & -8 \\ -3 & 11 \end{pmatrix}$

$= 1 \cdot \begin{pmatrix} 7 & -8 \\ -3 & 11 \end{pmatrix} =$ [illegible]

$K^{-1} = \begin{pmatrix} 7 & 18 \\ 23 & 11 \end{pmatrix}$

xi

$(23\ 8) \cdot \begin{pmatrix} 7 & 18 \\ 23 & 11 \end{pmatrix} = (161 + 184, 414 + 88$

$(345, 502) \% 26$

$= (7, 8)$

H I

yj

$(24, 9) \cdot \begin{pmatrix} 7 & 18 \\ 23 & 11 \end{pmatrix} = (168 + 207, 432 + 99) = (375, 531$

$(11, 11)$

H I L L L L

Plaintext = (7, 8) (11, 11)