Homework 5, due September 18

(1) (Page 58, problem 25) The operator of a Vigenère encryption machine is bored and encrypts a plaintext consisting of the same letter of the alphabet repeated several hundred times. The key is a six-letter English word. (No English word of length six is a shift of another English word.)
   (a) What property of the ciphertext will make Eve suspect that the plaintext is one repeated letter and will let her guess the key length?
   (b) If Eve knows that the key is an English word, how can she find the key?

(2) In a Vigenére ciphertext you are analyzing, you know that the word `the` is encrypted exactly the same way twice in the ciphertext; the distance between the two appearances (first letter to first letter) is 24. What are the possible lengths of the keyword?

(3) Suppose the matrix $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ is used for an encryption matrix in a Hill cipher. Find two plaintexts that encrypt to the same ciphertext. The plaintexts do not have to be in English.

(4)
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TKSYM WRJGH KBPTE IKCYR WXIEL QUPSU TLLGY FIKYI AVFNR LQFKV VSMBM
JOCZG ILSEA PZRGC VVHTV QYKXJ SHARV IPCOG HXGZC GLQNE EXLPD QVXWB
LVKCT RSVXY WUORP NEJKV YBROG IQRAB KZEGZ AAJSM QRANL AGZCG LKVAT
ZSUME AFQIC YSXLN PUSJL VORWI QVMUL EMVXV JHHPI GIKGP LVWAI TMTLJ
LQPVL JLBXP IIHGY ZMBWV SXLFH ZSGHK UTEKS DHCYV WWRTZ CYGQI CJMIN
RWBXY SVAJS XVFYT HZWPE MWUPZ MTEIX GHGYZ IJSNA USCKY GPLUE AKRHK
UTWMG LJKAL LWPVK YOVPM XYWQA UIZHF WUUGE VIOHG YVIVG VVEYL TBSXJ
CWUIZ GRFVL YPBLV VKMSI ZIEUG ZBGIR RLJPR J
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