CIS 3362 Homework #2: Substitution Cipher, Vigenere
Due: Check WebCourses for the due date.

Part A: Code Break Questions

1) Decode the following message, which was encrypted using the substitution cipher. Make sure to discuss all the steps you took, the key you arrived at, and the decoded message.

```
fzpgtofucfukqmzvftfuktofgzftouqmfmtosopvfupenopajttoptzqjedu
qtzqvcgqolvlpvlgqrllggqvvifmtolzlfvdkvprrpvtovlziqjqmmfopdtq
dqfttqopyluqlgptmfvgttolulbttzqrlggpklgfmdlsqdldzfeeelpdiqjt
qpnvfxlajtqueitolmfvgtnlvgquzoqdqlgftzfeeklttolnvfxlalspjglp
giqjcuqzpgptlpsolvfpruqtgqvfsofmiqjgqeylhjlgtfqutzqmfvgtiqjz
feekltpmvllsqniqmtolsqdlaqqcfmiqjgqeylhjlgtfqutvollmfvgtiqjz
feeklttludqeepvgkqqdejsc
```

2) Decode the following message, which was encrypted using the Vigenere cipher. Make sure to discuss all the steps you took, the key you arrived at, and the decoded message.

Here is the ciphertext:

```
vvgvexzqjzzsiogqhrlawvmldznhipghnuqeuqbsplqoevoeecslmbpyqpega
kexciwebzepglrhalfzosozzdavhryhyryhqachttnsrgawfrvskntwmeaoku
ekdsmfqyepghnnswrwoghmcewvhbulfzwiumjtymvsnpkfrniltmxwwqknvah
vzrwavesmnesvhnuztwzbspagcbpkcrmmfqbqcwotugaogtrltmcpgqufjvuc
ojazlesmeoqgiofvazukstaaohtwrzkixazopkqdvpntytweqadlogfvtztyz
twrcwwgvhrebskzhamtdeihfqkknkeecqqe
```

3) Decode the following message, which was encrypted using the Vigenere cipher. Make sure to discuss all the steps you took, the key you arrived at, and the decoded message.

```
dvapngkzabsybpgpekgpsjzcvyghecirtxvlvffxwsykuumdqirwbgicahzyu
hstlhofnduckdnabsjkhtycyzjauszvnjzbqcjpkglfrnvskwwdnoxvtwldki
qimchieprrjzqbxgyrgtzmvyghecirtxvlkjojbhktldzcvfknhtlzctpkcxg
cxhnrtnvscicpmaeffupagrlsttoieqymmvmjmknrtlvsnuwdnruwigzrifrd
mvkeepycuknatqkkhpauqljszwbvydbqqdciawtxtwhryfsawvkcpnvshzewm
hnvfahkgcmddqgieubjnpycwmullamgpurlhtomesvjnrpqbzrj
```

Part B: Written Questions Similar to Quiz/Exam Questions

4) Find 83^{-1} mod 188

5) For an affine cipher, we know that the ciphertext ‘N’ maps to the plaintext ‘E’ and the ciphertext ‘W’ maps to the plaintext ‘T’. Determine both the decryption AND encryption functions. Both answers must be in the form f(x) = (ax + b) mod 26, where a and b are in between 0 and 25, inclusive.

6) For an alphabet of size 100, how many possible keys would there be to the affine cipher? (Hint: Use logic and the inclusion-exclusion principle to more quickly determine the possible values of a, instead of listing them out one by one!)

7) Let x be a positive integer. A set of letters consists of 20 As, 25 Bs, 35 Cs, 70 Ds, and 50 Es. What is the index of coincidence of the set? **Leave your answer as a fraction in lowest terms.**

8) The set of letters S consists of 30 As, 6 Bs, 24 Cs, 15 Ds, and 15 Es. The set of letters T consists of 25 As, 20 Bs, 15 Cs, 5 Ds and 35 Es. What is the mutual index of coincidence between sets S and T? **Leave your answer as a fraction in lowest terms.**