If you are using more than one sheet of paper, make sure that you staple all the sheets together.

Show your work clearly.

1. Factor 10000000000000000001.

2. Solve the modular equation $16x \equiv_{1009} 1$. (In other words, find the inverse of 16 modulo 1009.)

3. The following ciphertext was produced using an affine cipher:

   $ghyuvqytgxqmxpyqxydu$

   Find the plaintext. (The plaintext is an English sentence.)