Due date: February 11

**Problem 1**
Prove or disprove the following:
  a) \( I(X + Y; Y|X) = 0 \).
  b) \( H(X|Z) - H(X|Y, Z) = H(Y|Z) - H(Y|X, Z) \).
  c) \( I((X_1, \ldots, X_n); (Y_1, \ldots, Y_n)) = \sum_{i=1}^{n} H(Y_i|Y_1 \ldots Y_i-1) - H(Y_i, X_i \ldots X_n|Y_1 \ldots Y_i-1, X_1 \ldots X_{i-1}) + H(X_1 \ldots X_n|Y_1 \ldots Y_{i-1}, X_1 \ldots X_{i-1}) \).
  d) \( I((X_1, \ldots, X_n); (Y_1, \ldots, Y_n)) \geq \sum_{i=1}^{n} H(Y_i|Y_1 \ldots Y_i-1) - H(Y_i|Y_1 \ldots Y_{i-2}, X_1 \ldots X_n) \).
  Let \( Z = X + Y \) in the following:
  e) \( H(Z) = H(X) + H(Y) \).
  f) \( H(Z, X) = H(X) + H(Y) \).

**Problem 2**
Problem 2.7 in Cover and Thomas.

**Problem 3**
Problem 2.9 in Cover and Thomas.

**Problem 4**
Problem 2.11 in Cover and Thomas.