EE 5581 Prof. N. Jindal
Information Theory & Coding Oct. 3, 2005

Homework 4
Due: Wednesday, October 12

1. *Entropy.* Show the following expression holds for any probability mass function (p_1, p_2, p_3):

$$H(p_1, p_2, p_3) = H(p_1) + (p_2 + p_3)H\left(\frac{p_2}{p_2 + p_3}, \frac{p_3}{p_2 + p_3}\right).$$

2. C & T 5.4
3. C & T 5.5
4. C & T 5.6
5. C & T 5.9
6. C & T 5.12
7. C & T 5.15
8. C & T 5.18
   Note: The definition of a uniquely decodable code states that every input sequence of *any* length must map to a different codeword. In this problem you show that an equivalent condition for unique decodability is showing that *for each* $k \geq 1$, the mapping from all length k sequences to output codewords is one-to-one. The difference is that the equivalent condition only compares the codewords of input sequences of equal length, while the definition compares codewords of input sequences of possibly different lengths.