

Math 5251 Homework 1 additional problem

Due February 1, 2023

(Problems from Vic Reiner)

1. Consider a source $W = \{A, B, C, D, E\}$ and encoding maps $f_i : W \rightarrow C_i$ mapping the 5 letters in order onto these three collections C_1, C_2, C_3 of codewords:

$$C_1 = \{0, 10, 110, 1110, 1111\}$$

$$C_2 = \{0, 10, 110, 1110, 1101\}$$

$$C_3 = \{0, 01, 011, 0111, 1111\}$$

Indicate (with explanation) for each i whether or not f_i is

- (a) uniquely decipherable
 - (b) prefix (a.k.a. instantaneous)
2. Does there exist a binary code which is instantaneous and has code words with lengths $(1, 2, 3, 3)$? If not, prove it. If so, construct one.