ENEE/CMSC/MATH 456: Cryptography
MAC Class Exercise 3/4/19

Let F be a length-preserving pseudorandom function. Show that each of the following message authentication codes is insecure. (In each case the shared key is a random $k \in \{0,1\}^n$.)

1. To authenticate a message $m = m_1||m_2$, where $m_1, m_2 \in \{0,1\}^n$, compute $t := F_k(m_1)||F_k\big(m_2 \oplus F_k(m_1)\big)$.

2. To authenticate a message $m = m_1||\cdots||m_\ell$, where $m_i \in \{0,1\}^n$, choose $r \in \{0,1\}^n$ at random and compute $t := r||F_k(m_1 \oplus r)||\cdots||F_k(m_\ell \oplus r)$.