Cryptography: Problem Set #1

Due on Monday, June 2nd at 10:00pm

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Problem 1

(3.1) Question:
Show that $S_1(x_1) \oplus S_1(x_2) \neq S_1(x_1 \oplus x_2)$ for:

1. $x_1 = 000000, x_2 = 000001$
2. $x_1 = 111111, x_2 = 100000$
3. $x_1 = 101010, x_2 = 010101$

Solutions:

1. (a) $(S_1((x_1 = 0, 0 = 14) = 1110 \oplus S_1((x_2 = 0, 1 = 00 = 0000)) = 1110$
   (b) $S_1(000000 \oplus 0000001) = S_1(000001) = 0000$
   (c) $0000 \neq 1110$
2. (a) $(S_1(x_1 = 15, 3 = 13) = 1101 \oplus S_1(x_2 = 0, 2 = 04) = 0100) = 1001$
   (b) $S_1(111111 \oplus 100000) = S_1(011111) = 1000$
   (c) $1001 \neq 1000$
3. (a) $(S_1(x_1 = 5, 2 = 06) = 0110 \oplus S_1(x_2 = 10, 1 = 12) = 1100) = 1010$
   (b) $S_1(101010 \oplus 010101) = S_1(111111) = 1101$
   (c) $1010 \neq 1101$