Homework Assignment #6
Due: July 17, 2020 at 12:00 noon

1. Consider an ADT that stores a vector of n bits $b_1, b_2, \ldots, b_n$ where each $b_i \in \{0, 1\}$. It supports the following operations.

- TOGGLE(i) (where $1 \leq i \leq n$) changes the value of bit b_i to the opposite of its current value.

- OR(i, j) (where $1 \leq i \leq j \leq n$) returns $b_i \vee b_{i+1} \vee \cdots \vee b_j$.

- AND(i, j) (where $1 \leq i \leq j \leq n$) returns $b_i \wedge b_{i+1} \wedge \cdots \wedge b_j$.

Design a data structure to implement this ADT efficiently. Explain why it is correct and analyse the worst-case running time for each of the three operations in terms of n. The worst-case running time of every operation should be sublinear in n.