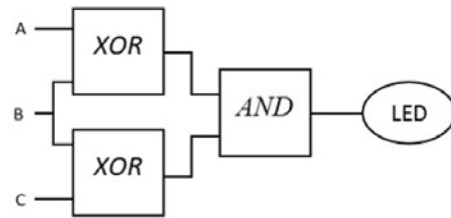


## MATH 6: ASSIGNMENT 22, REVIEW 1

May 5, 2019

1. There is an island of Knights and Knaves. On this island, there are two kinds of people: Knights, who always tell the truth, and Knaves, who always lie. Unfortunately, there is no easy way of knowing whether a person you meet is a knight or a knave...
  - a. If Zoe is from that island can she say: "I am a knave"?
  - b. There are two native islanders, named Alice and Bob, standing next to each other. You do not know what type either of them is. Suddenly, Alice says "At least one of us is a Knave." What are Alice and Bob?
  - c. On the island of knights and knaves, you meet two inhabitants: Sue and Zippy. Sue says that Zippy is a knave. Zippy says, "I and Sue are knights." So, who is a knight and who is a knave?

2. The diagram shows some circuit constructed of 3 logical chips (each with two inputs and one output; we draw them so that the inputs are on the left and the output, on the right). Can you determine for which values of inputs the LED will light up? [Hint: this is the same as writing a truth table for some formula....]



3. Using truth table show that  $\text{NOT}(X \text{ AND } Y) = (\text{NOT}(X)) \text{ OR } (\text{NOT}(Y))$
4. Using Venn diagrams, explain why  $\overline{A \cap B} = \bar{A} \cup \bar{B}$ .
5. In a class of 25 students, 10 students know French, 5 students know Russian, and 12 know neither. How many students know both Russian and French?
6. Draw the following sets on the number line:
  - a. Set of all numbers  $x$  satisfying  $x \leq 2$  and  $x \geq -5$
  - b. Set of all numbers  $x$  satisfying  $x \leq 2$  or  $x \geq -5$
  - c. Set of all numbers  $x$  satisfying  $x \leq -5$  or  $x \geq 2$
7. Draw a set and its complement on a two separate number lines:  
 $(a, b) = \{x \mid a < x < b\}$  is the interval from  $a$  to  $b$  (**not** including endpoints)  
 $[a, \infty) = \{x \mid a \leq x\}$  is the half-line from  $a$  to infinity (including  $a$ )