

TMCS Fall 2016, HW 1

Please bring your solutions to class on Thursday September 15. You are invited to work in teams of two but not larger. If you work in a team, submit only a single sheet with both names marked on it.

Problem 1 (20 pts). Express the XOR function by a Boolean formula with variables X and Y and no other Boolean functions than \wedge , \vee , and \neg . Write the formula in a syntactically painstakingly correct way, according to the definition of the syntax of BFs.

Problem 2 (30 pts). Give a truth table for $(X \leftrightarrow (Y \leftrightarrow Z))$.

Problem 3 (50 pts). Find a Boolean formula φ with variables X, Y, Z such that for every interpretation $\mathcal{I}: \{X, Y, Z\} \rightarrow \{0, 1\}$ it holds that if \mathcal{I} is changed on any one of X, Y, Z , then $\mathcal{I}(\varphi)$ also changes. You may use other logical connectives besides NOT, AND, OR to specify your formula. *Hint:* you will be guided toward the solution if you first consider the easier case of only two Boolean variables.