

## GenICT Fall 2015, Module 2 (Boolean logic), HW 1

Please upload a pdf file with your solutions (legibly hand-written and scanned, or typeset documents) to <https://jgrader.de> by Tuesday, Oct 6, 23:59.

**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  $\varphi$  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.