

Solved exercises must be marked and solutions (as a single PDF file) uploaded in **OLAT**. The (strict) deadline is 7 am on May 23.

Exercises

- (2) 1. Use resolution to determine whether the formula

$$\varphi = \neg\forall x \exists y \neg P(x, y) \wedge (\forall z \exists w P(w, z) \rightarrow \forall z' Q(z'))$$

is satisfiable.

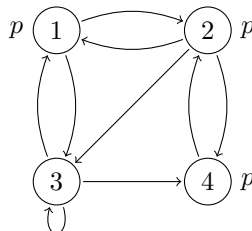
- (3) 2. Consider the boolean function $f(x, y, z) = x \oplus (y + z)$.

(a) Is f monotone? Is f self-dual? Is f affine?

(b) Can \bar{x} be expressed (only) using f ?

- (2) 3. Let f be a boolean function such that $\{f\}$ is adequate. Is $\{\hat{f}\}$ adequate? Here \hat{f} is the dual of f : $\hat{f}(x_1, \dots, x_n) = \overline{f(\overline{x_1}, \dots, \overline{x_n})}$.

- (3) 4. Consider the CTL formula $\varphi = E[EG p \wedge EX \neg p \cup AX p]$ and the following model \mathcal{M} :



(a) Draw the parse tree of φ and list all its subformulas.

(b) Use the CTL model checking algorithm to determine in which states of \mathcal{M} the formula φ holds.

(c) Find a CTL formula ψ such that $\mathcal{M}, 1 \models \psi$ and $\mathcal{M}, 2 \not\models \psi$.