

# Theory of Computer Science

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Spring Term 2019

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## Exercise meeting 2

### Exercise 2.1 (Formula Sets and Resolution)

Use the resolution calculus to show for the set of formulas

$$\text{KB} = \{(A \vee B), (\neg B \vee C)\}$$

that  $\text{KB} \models (A \vee C)$ .

### Exercise 2.2 (Syntax of Predicate Logic)

Which of the following expressions are syntactically correct formulas or terms for the following signature  $\mathcal{S}$ ? Analyse also all subformulas and all subterms. For the formulas, also state what kind of formulas they are (atomic formula, conjunction, ...).

$$\mathcal{S} = \langle \mathcal{V}, \mathcal{C}, \mathcal{F}, \mathcal{P} \rangle$$

with  $\mathcal{V} = \{x, y, z\}$ ,  $\mathcal{C} = \{c\}$ ,  $\mathcal{F} = \{f, g, h\}$ , where  $ar(f) = 3$ ,  $ar(g) = ar(h) = 1$ , and  $\mathcal{P} = \{Q, R, S\}$ , where  $ar(Q) = 2$ ,  $ar(R) = ar(S) = 1$ .

- (a)  $f(x, y, z)$
- (b)  $f(x, y)$
- (c)  $Q(x, y)$
- (d)  $(g(x) = R(y))$
- (e)  $(g(x) = f(y, c, h(x)))$
- (f)  $\forall c Q(c, x)$
- (g)  $(R(x) \wedge \forall x S(x))$
- (h)  $(g(h(x)) \wedge R(x))$
- (i)  $(\forall x \exists y (g(x) = y) \vee (h(x) = c))$