The exercises consist of exercise for *Computational Logic* (*CL* for short) and *Automated Theorem Proving* (*ATP* for short). The exercises for *CL* can be found in Fitting's book. The exercises for *ATP* can be found in the lecture notes. Only marked exercises will be discussed.

- Give resolutions proofs of the following formulas: (*ATP*)
  1. $\exists x \forall y R(x, y) \to \forall y \exists x R(x, y)$
  2. $\exists x(P(x) \to \forall x P(x))$.
  3. $\forall x \forall y(P(x) \wedge P(y)) \to \exists x \exists y(P(x) \vee P(y))$.
  4. $\forall x \forall y(P(x) \wedge P(y)) \to \forall x \forall y(P(x) \vee P(y))$.
  5. $\forall x \exists y \forall z \exists w(R(x, y) \vee \neg R(w, z))$.
- Consider the following alternative to Definition 2.7:

$$\mathsf{Res}_1^0(\mathcal{C}) := \mathcal{C} \qquad \mathsf{Res}_1^{n+1}(\mathcal{C}) := \mathsf{Res}(\mathsf{Res}_1^n(\mathcal{C}))$$
$$\mathsf{Res}_1^*(\mathcal{C}) := \bigcup_{n \geqslant 0} \mathsf{Res}_1^n(\mathcal{C}) \ .$$

  Is this definition equivalent to the original one? In particular decide whether the following holds: $\Box \in \mathsf{Res}^*(\mathcal{C})$ iff $\Box \in \mathsf{Res}_1^*(\mathcal{C})$ for any clause set $\mathcal{C}$. (*ATP*)
- Problem 10.12 (*ATP*)