Exercise 1

a) Give a formula describing the Unequal game instance of Series 3 Exercise 2 in *equality logic with uninterpreted functions*. Remember, that the formula shall be satisfiable iff the game instance has a solution. You must not use propositional variables in your solution!

b) Compare the resulting formula to the propositional encoding. More precisely, compare the number of literals and clauses using the big $\mathcal{O}$ notation. Draw a conclusion.

Exercise 2

Consider the following formula in equality logic:

$$\varphi \quad := \quad a = b \,\wedge\, (\, b = c \,\vee\, c = e \,) \,\wedge\, (\, b = d \,\vee\, c = f \,) \,\wedge\, a \neq e$$

a) Simplify the formula φ using the method presented in the lecture, based on polar equality graphs (slides 37-38).

b) For the simplied formula, construct the equality graph without polarity and make it chordal. What are the chord-free simple cycles?

c) Construct the satisfiability-equivalent propositional logic formula for φ using the previous results from b).