

Intelligent Systems

## Exercise sheet 2

# Propositional Logic

### Exercise 1<sup>1</sup> (10 points)

Show that the following formulas are equivalent using (a) truth tables and (b) deduction rules (two sub-exercises!)

$$U = ((A \vee \neg(B \wedge A)) \wedge (C \vee (D \vee C)))$$
$$V = (C \vee D)$$

### Exercise 2 (10 points)

Decide for the following formulas if they are valid, satisfiable, or unsatisfiable:

- (a)  $(A \vee \neg B \vee C) \wedge (\neg A \vee B \vee \neg C)$
- (b)  $A \wedge (\neg B \vee \neg A) \wedge B \wedge (\neg B \vee A)$
- (c)  $\neg(A \wedge B) \Leftrightarrow (\neg A \vee \neg B)$

### Exercise 3<sup>2</sup> (10 points)

Given the following, can you prove that the unicorn is mythical? How about magical? Horned?

If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.

Formalize this problem in propositional logic and solve it using Resolution.

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<sup>1</sup> Exercise from U. Schöning

<sup>2</sup> Exercise from Russell/Norvig

