CSE 412A Spring 2022 Introduction to Artificial Intelligence

Exercise 10

- You have approximately as many minutes as there are points.
- Mark your answers ON THE EXERCISE ITSELF. If you are not sure of your answer you may wish to provide a *brief* explanation. All short answer sections can be successfully answered in a few sentences AT MOST.
- For True/False questions, please *circle* your answer.

First name	
Last name	
WUSTL ID	

For staff use only:

Q1.	Propositional Logic	/12
	Total	/12

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Q1. [12 pts] Propositional Logic

1 If it rains, William brings his umbrella. 2 If William has an umbrella, he doesn't get wet. 3 If it doesn't rain, William doesn't get wet.

(a) [3 pts] Translate the statements above into propositional logic in *Horn form*, using *only* the propositional symbols **R** (for rain), **U** (for William bringing his umbrella), and **W** (for William getting wet).

Horn: $(\neg x_1 \vee \neg x_2 \vee \dots \vee \neg x_n \vee y)$

1. $R \rightarrow U$
2. $U \rightarrow \neg W$
3. $\neg R \rightarrow \neg W$

(b) [3 pts] Translate the statements into conjunctive normal form (CNF).

$\alpha \rightarrow b \equiv \neg \alpha \vee b$

1. $\neg R \vee U$
2. $\neg U \vee \neg W$
3. $R \vee \neg W$

$(\neg R \vee U) \wedge (\neg U \vee \neg W) \wedge (R \vee \neg W)$

(c) [2 pts] Show that the combined statements above entail that William doesn't get wet using *resolution*.

$KB = \{\neg R \vee U, \neg U \vee \neg W, R \vee \neg W\}$

resolution:

$$\frac{\alpha \vee b, \ \neg \alpha \vee c}{b \vee c}$$

$KB \wedge \neg(\neg W) = \{\neg R \vee U, \neg U \vee \neg W, R \vee \neg W, W\}$

$U \vee \neg W$

$\neg W$

false