German University in Cairo
Department of Computer Science
Assoc. Prof. Haythem O. Ismail

Knowledge Representation and Reasoning, Spring Term 2019
Assignment 4

Exercise 4-1

Using the FOPL system of natural deduction introduced in class, prove the following.

a) $\vdash (\neg\exists x P(x)) \Leftrightarrow \forall x(\neg P(x))$.

b) $\vdash \exists x(P(x) \vee Q(x)) \Leftrightarrow (\exists x P(x) \vee \exists x Q(x))$

c) $\vdash \forall x[P(a) \Rightarrow Q(x)] \Leftrightarrow [P(a) \Rightarrow \forall x[Q(x)]]$

Exercise 4-2

Using the tableau method introduced in class, check whether

a) $\models \exists x(P(x) \vee Q(x)) \Leftrightarrow (\exists x P(x) \vee \exists x Q(x))$

b) $\{\exists x P(x) \wedge \exists x Q(x)\} \models \exists x(P(x) \wedge Q(x))$

Exercise 4-3 **Submission**
Due by 13:45, Tuesday February 26th 2019

Name: **App #:**

Part (b) of Exercise 4-1.