ASHESI

Discrete Structures and Theory (Spring 2023)
Homework 3
Deadline: 10/02/2023

1. (6 POINTS) Translate in two ways each of these statements into logical expressions using predicates, quantifiers, and logical connectives. First, let the domain consist of all dogs and second, let it consist of all living creatures.
   a) Some dogs have been in a movie.
   b) All dogs have fur.
   c) No dog can fly.

2. (6 POINTS) Express each of these statements using quantifiers. Then form the negation of the statement so that no negation is to the left of a quantifier. Next, express the negation in simple English. (Do not simply use the phrase "It is not the case that.")
   a) Every Ashesi student is hardworking.
   b) There is a pig that knows logic programming.
   c) No cat enjoys being on camera.

3. (3 POINTS) Let $P(x, y)$ be the statement "Faculty x has taught student y" where the domain for x consists of all faculty members at your university and that for y consists of all students in your class. Express each of these quantifications in English.
   a) $\exists x \exists y P(x, y)$
   b) $\exists x \forall y P(x, y)$
   c) $\forall x \exists y P(x, y)$
   d) $\exists y \forall x P(x, y)$
   e) $\forall y \exists x P(x, y)$
   f) $\forall x \forall y P(x, y)$