HW 1 Supplemental Problems

Nithya Jayakumar

January 15, 2023

1. Five people of different mythical species and with different jobs live in consecutive houses along a street. These houses are painted different colors. They have different pets and have different favorite drinks. Determine who owns a cat and whose favorite drink is soda given these clues: The Hobbit lives in the red house. The Dwarf owns a dog. The Human is an artist. The Maia drinks tea. The Elf lives on the first house on the left. The green house is immediately to the right of the white one. The harpist breeds snails. The ranger lives in the yellow house. Milk is drunk in the middle house. The owner of the green house drinks coffee. The Elf's house is next to the blue one. The pianist drinks orange juice. The fox is in a house next to that of the physician. The horse is in a house next to that of the ranger.

2. In this course, we have defined Boolean functions as being constructed from propositional variables (such as p and q) as well as the logical operators $\land$, $\lor$ $\neg$, $\Rightarrow$, and $\Leftrightarrow$.

   A set of logical operators is **functionally complete** if every Boolean function can be expressed using only the operators in the set.

   Show that $\neg$ and $\land$ form a functionally complete collection of logical operators.