Homework 4 - Predicates, Quantifiers

CS 241

February 17, 2025

1. Section 1.5 exercises: 1.5. 7, 10, 12, 14, 20, 22, 24, 25, 29, 53, 55, 59(only for 53,55)

2. Section 1.6 exercises: 34-38, 48-51, 54-57, 62

3. Write the following statements in words. Determine the truth value of every statement. If the statment is false, write its negation using the De Morgan Laws. The final form will not contain the symbol $\neg$

   (a) in $\mathbb{Z}$: $\forall x. \forall y.\, x - y = 7$

   (b) in $\mathbb{Z}$: $\exists x. \exists y.\, x - y = 7$

   (c) in $\mathbb{Z}$: $\forall x. \exists y.\, x - y = 7$

   (d) in $\mathbb{Z}$: $\exists x. \forall y.\, x - y = 7$

   (e) in $\mathbb{Q}$: $\forall x. \exists y.\, xy = 7$

   (f) in $\mathbb{Q}$: $\forall x. \exists y.\, (x \neq 0) \rightarrow xy = 7$

   (g) in $\mathbb{Q} - \{0\}$: $\forall x. \exists y.\, xy = 7$

   (h) in $\mathbb{Z}$: $\forall x. \exists y.\, x > y$

   (i) in $\mathbb{Z}$: $\exists y. \forall x.\, x \leq y$