

Midterm 1 Version 2 Solution

March 19, 2020

Question 1

a. Since

$S_1 = \{1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29\}$, and $S_2 = \{1, 2, 3, 5, 6, 10, 15, 30\}$,

$S_1 \cap S_2 = \{1, 2, 3, 5\}$

b. See the table below

| p | q | r | $\neg p$ | $\neg p \Leftrightarrow q$ | $(\neg p \Leftrightarrow q) \Rightarrow r$ |
|-----|-----|-----|----------|----------------------------|--|
| T | T | T | F | F | T |
| T | T | F | F | F | T |
| T | F | T | F | T | T |
| F | T | T | T | T | F |
| T | F | F | F | T | F |
| F | F | T | T | F | T |
| F | F | F | T | F | T |

c. Let $x \in \mathbb{N}$. Assume $P(x)$.

We will prove that there is a natural number y such that the predicate $Q(x, y)$ is true.

Question 2

a. $\forall x \in P, Cat(x) \wedge Loves(x, x)$

Question 3

Question 4