

CSE 015: Discrete Mathematics
Homework #2
Solution

Arvind Kumar
Lab CSE-015-07L

February 8, 2022

Chapter 1.4

1. Question 52:

- (a) If we say that $P(x)$ and $Q(x)$ consists of even and odd numbers respectively, for the set in which the number are natural numbers, then the statement $\forall (P(x) \vee Q(x))$ is true. The natural numbers consist of odd and even numbers. However, $\forall (P(x) \vee \forall Q(x))$ is false since not all the set of natural numbers are odd or even. Hence, the set of the natural numbers can have both even or odd numbers.

2. Question 54:

- (a) 54(a): $\exists!x(x>1)$ This is false, because there can only be 1 unique x value. This can have values that are greater than 1, which also means multiple possible values that makes this false.
- (b) 54(b): $\exists!x(x^2=1)$ This is false, because there can only be 1 unique x value. This can have positive and negative 1 if one were to square root the x in the x -squared.

Chapter 1.5

3. Question 12:

- (a) 12(a): $\neg I(\text{Jerry})$
- (b) 12(b): $\neg C(\text{Rachel}, \text{Chelsea})$

Question 24:

- (a) 24(a): $\exists x \forall y (x + y = y)$ Statement: "There is a real number x such that for all real numbers, y , it is true that $x + y = y$."
- (b) 24(b): $\forall x \forall y (((x \geq 0) \wedge (y < 0)) \rightarrow (x - y) > 0)$ Statement: "For real numbers, x and y , if x is a non-negative real number and y is negative real number, then $x-y$ is always a positive real number."

Question 25:

- (a) 25(a): $\exists x \forall y (xy = y)$ Statement: "For real number y , there is a real number x , such that $xy = y$."

- (b) 25(b): $\forall x \forall y ((x < 0) \wedge (y < 0) \rightarrow (xy > 0))$ Statement: "For real numbers, x and y, if x is negative and y is negative, then xy is positive."