Discrete Mathematics

HW0

Theeradon Sarawek
6680210

1.1) $\{3, 4, 5, 6, 7\}$ $[2 < n < 8]$

1.2) $\{x \in I \mid x^2 < 10\}$
$\to$ $\{-3, -2, -1, 0, 1, 2, 3\}$

assuming 0 is neither positive nor negative

1.3) $\{x \in I^+ \mid x^2 < 10\} \cup \{x \in I^+ \mid 2 < x < 8\}$
$\to$ $\{1, 2, 3, 4, 5, 6, 7\}$

1.4) $\{x \in I^+ \mid x^2 < 10\} \cap \{x \in I^+ \mid 2 < x < 8\}$
$\to$ $\{3\}$

$\exists \to$ there exists
$\forall \to$ for every

Problem II

2.1) $\exists x \in M$ such that $P(x)$

2.2) $\exists x \in M$ such that $P(x) \wedge Q(x)$

2.3) $\exists x \in M$ such that $P(x) \wedge \neg Q(x)$

2.4) $\exists x \in M$ such that $P(x)$

2.5) $\exists x \in M$ such that $\neg Q(x)$

2.6) $\forall x \in A, Q(x)$

2.7) $\exists x \in B$ such that $\neg P(x)$

2.8) $\exists x \in A, \forall y \in B$ such that $f(x, y)$

2.9) $\forall x \in B\ \exists y \in A$ such that $f(x, y)$

2.10) $\exists x \in \mathbb{A}, \forall y \in \mathbb{B}$ such that $\neg F(x, y)$

3.1) $P \Rightarrow (\neg Q \vee R)$

P	Q	$\neg Q$	$\neg Q \vee P$	$P \Rightarrow \neg Q \vee P$
T	T	F	T	T
T	F	T	T	T
F	T	F	F	T
F	F	T	T	T

3.2) $P \Rightarrow (P \wedge Q)$

P	Q	$P \wedge Q$	$P \Rightarrow P \wedge Q$
T	T	T	T
T	F	F	F
F	T	F	T
F	F	F	T

3.3) $(P \wedge R) \vee (Q \wedge R)$

P	Q	R	$P \wedge R$	$Q \wedge R$	$(P \wedge R) \vee (Q \wedge R)$
T	T	T	T	T	T
T	T	F	F	F	F
T	F	T	T	F	T
T	F	F	F	F	F
F	T	T	F	T	T
F	T	F	F	F	F
F	F	T	F	F	F
F	F	F	F	F	F

4.1) $\forall x \in I, \exists y \in I$ such that $x+y=23$

↳ This statement is True as you'd be able to change the value of y based on x to get 23.

$\exists y \in I$ such that $x+y=23, \forall x \in I$

↳ This statement is False as they assume that there is a certain integer y that would satisfy the equation for any value of x that is an integer.

Therefore, the statements aren't the same.

4.2)

A) $\forall x \in X, \exists y \in Y$ such that $P(x,y) \Rightarrow \exists y \in Y$ such that $P(x,y)$ $\forall x \in X$

For every boy x, there exists a girl y such that if x secretly likes y, this implies that there exists a girl y such that they are liked by every boy x in the class.

This idea is not true as it assumes that a boy cannot admire a unique girl each. In the case of any class, if the boys all like unique girls then chances are that there cannot be a girl that all the boys like.

4.2B) $\exists y \in Y$ such that $P(x,y)\ \forall x \in X \Rightarrow \forall x \in X$, $\exists y \in Y$ such that $P(x,y)$

"There exists a girl y such that they are liked by every boy x. This implies that for every boy x, there exists a girl y that they like."

This statement is automatically true as if a girl is admired by every boy, then every boy would have a girl they like with this girl being girl y.