Skill Mastery Quiz 4

Communicating in Math (MTH 210-01)
Winter 2020

Name:

L3-3 Construct a truth table for $P \to (Q \vee R)$.

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

L4-3 Write the set $\{\ldots, -5, -3, 1, 1, 3, 5, \ldots\}$ using set builder notation.

As usual there are many ways to do this. One way is $\{x \in \mathbb{Z} \mid x = 2n + 1 \text{ for some } n \in \mathbb{Z}\}$.

L5-2 Write a useful negation of the following statement:

$$\text{There exists } n \in \mathbb{N} \text{ such that if } a \in \mathbb{N} \text{ then } \tfrac{1}{n} < a.$$

Useful negations don't start with "It is not true that..." and avoid the word not in cases where it could be replaced (e.g., don't use "not even").

A negation is: "for all $n \in \mathbb{N}$, $a \in \mathbb{N}$ and $\frac{1}{n} \geq a$." A negation that is slightly better worded is "for all $n \in \mathbb{N}$ there exists $a \in \mathbb{N}$ such that $\frac{1}{n} \geq a$."

P3-1 The following statement is incorrect:

$$\text{If } n \text{ is an integer then } n^2 \equiv 1 \pmod 3.$$

Show the statement is false using a counterexample. You should clearly explain why the counterexample you found shows the statement is false.

This statement is false and there are many counterexamples. For example, consider $n = 0$. Note n is an integer and $n^2 = 0$. However, $3 \nmid 0 - 1$ (because there is no integer x such that $3x = -1$, and therefore $n^2 \not\equiv 1 \pmod 3$. Thus we have found an n that makes the hypothesis true and the conclusion false, making the statement false.