

Quiz #2: Solutions

Monday, September 25 2017

Problem 1.

Let us name the following propositions:

p : “Socrates is a cat.”

q : “Socrates is a mortal.”

r : “Socrates is a man.”

The argument under consideration is:

$$\frac{p \rightarrow q \quad r \vee (\neg q)}{p \rightarrow r}$$

In order to determine the validity or invalidity of this argument, we write a truth table:

p	q	r	$p \rightarrow q$	$r \vee (\neg q)$	$p \rightarrow r$
T	T	T	T	T	T
T	T	F	T	F	F
T	F	T	F	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	F	T
F	F	T	T	T	T
F	F	F	T	T	T

Let us look at the lines of this truth table where both the premises $p \rightarrow q$ and $r \vee (\neg q)$ are true: these are the lines 1, 5, 7, and 8. For each of these lines, we see that the conclusion $p \rightarrow r$ is true. We thus have established that **the argument is valid**.

Problem 2 (~ 4 points.).

(1) $\forall n \in \mathbb{N} \quad n + 1 > n$: True

(2) $\exists t \in \mathbb{R} \quad t > -t$: True

(3) $\forall x \in \mathbb{R} \quad (x^2 > 0 \rightarrow x > 0)$: False

(4) $\exists \alpha \in \mathbb{R} \quad (\alpha^2 > 0 \rightarrow \alpha > 0)$: True

(5) $\exists w \in \mathbb{Z} \quad ((w \geq 0) \wedge (w \leq 0))$: True

(6) $\forall x \in \mathbb{R} \quad x^2 - 3x + 2 = 0$: False

(7) $\forall y \in \mathbb{R} \quad ((y^2 - y = 0) \leftrightarrow ((y = 0) \vee (y = 1)))$: True

(8) $\exists \theta \in \mathbb{R} \quad ((\theta^2 = 1) \leftrightarrow (\theta = 1))$: True