

Math 2283 - Introduction to Logic

Quiz #6 - 2008.09.26

Solutions

Consider the following definitions:

$\mathbb{V} = \{ \text{all the letters of the alphabet} \}$

$\mathbb{A} = \mathbf{C}_{\alpha} [\alpha \text{ is a letter in the word } \textit{antidisestablishmentarianism}]$

$\mathbb{O} = \{a, e, i, o, u, \}$

$\mathbb{N} = \mathbf{C}_{\alpha} [\alpha \text{ is a consonant}]$

$\mathbb{S} = \mathbf{C}_{\alpha} [\alpha \text{ is a letter in the word } \textit{strengthlessnesses}]$

$\mathbb{T} = \mathbf{C}_{\alpha} [\alpha \text{ is a letter in the word } \textit{aerious}]$

Determine if the following sentences are true:

1.

$$\mathbb{T} \subset (\mathbb{O} \cup \mathbb{S})$$

This is true, all vowels found in \mathbb{T} can be found in \mathbb{O} , and the r and s left in *aerious* can be found in \mathbb{S} .

2.

$$\mathbf{A}_{\alpha} [(\alpha \in \mathbb{O}) \rightarrow (\alpha \in \mathbb{T})]$$

This is true, all vowels appear in the word *aerious* (in order to boot!).

3.

$$\mathbf{E}_{\alpha, \beta} [(\alpha \neq \beta) \wedge (\alpha, \beta \in (\mathbb{S} \cap \mathbb{O}))]$$

This is false, the only vowel in the word *strengthlessnesses* is e .

4.

$$\mathbf{A}_{\alpha} [(\alpha \in \mathbb{A}) \leftrightarrow ((\alpha \in \mathbb{N}) \vee (\alpha \in \mathbb{O}))]$$

This is false, take for example the letter j .

5.

$$\mathbf{E}_{\alpha} [(\alpha \in \mathbb{T}') \wedge \sim ((\alpha \in \mathbb{N}) \vee (\alpha \in \mathbb{S}))]$$

To make this true, we need to make both $(\alpha \in \mathbb{T}')$ and $\sim ((\alpha \in \mathbb{N}) \vee (\alpha \in \mathbb{S}))$ with the same letter. For the first to be true, the letter in question must be a consonant not equal to r or s . For the second to be true, it must be false that the letter is a consonant or the letter e . This means for the second to be true, the letter must be a, i, o or u all of which are vowels. So the statement is false.