

Homework 2

PHIL-205-01:Symbolic Logic

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1 Section 1

Using the following symbolization key:

domain: songs
Bx: x was written by Joan Baez.
Dx: x is about Bob Dylan.
Px: x was covered by Judas Priest.
d: "Diamonds and Rust".

Symbolize the following English sentences in First Order Logic.

1. "Diamonds and Rust " was written by Joan Baez, is about Bob Dylan, and was covered by Judas Priest.

$$Bd \wedge Dd \wedge Pd \quad (1)$$

2. Judas Priest covered a song that Joan Baez wrote.

$$\exists x(Px \implies Bx) \quad (2)$$

3. If there is no song that was written by Joan Baez and covered by Judas Priest, then "Diamonds and Rust" either wasn't written by Joan Baez or it isn't about Bob Dylan.

$$(\neg \exists x(Bx \wedge Px)) \implies (\neg Bd \vee \neg Dd) \quad (3)$$

4. Judas Priest covered every song that Joan Baez wrote about Bob Dylan.

$$\forall x((Bx \wedge Dx) \implies Px) \quad (4)$$

5. If "Diamonds and Rust" is about Bob Dylan, then Judas Priest covered a song about Bob Dylan.

$$Dd \implies (\exists x[Px \wedge Dx]) \quad (5)$$

2 Section 2

Determine whether the following argument is valid (preferably using shortcuts).

$$\begin{aligned}
 &(A \vee B) \wedge (C \vee D) \\
 &B \implies D \\
 &\neg D \\
 &\therefore A \wedge C
 \end{aligned}
 \tag{6}$$

A	B	C	D	$(A \vee B) \wedge (C \vee D)$			$B \implies D$			$\neg D$	$A \wedge C$
1	1	0	0	1	0	0	1	0	0	1	0
1	0	0	0	1	0	0	0	1	0	1	0
0	1	1	0	1	1	1	1	0	0	1	0
0	0	1	0	0	0	1	0	1	0	1	0
0	1	0	0	1	0	0	1	0	0	1	0
0	0	0	0	0	0	0	0	1	0	1	0

To make solving this easier, I set A and C such that $A \wedge C$ would be false. I then set D such that $\neg D$ would be true. This leaves the remaining lines being pertinent and necessary to determine the validity of the argument. The rows removed were removed as they do not change whether the argument is valid, as they either contain a false premise or a true conclusion. Solving $(A \vee B) \wedge (C \vee D)$ next showed only one line in the table where said premise was true. This line is when B is true, and D is false, meaning that $B \implies D$ is false. This means that there are no false conclusions with all-true premises.

Therefore, this argument is valid.