Midterm #2 Answers

Name: _____

ID#: _____

PHILOSOPHY 279 Lec 03
Winter 2015

TEST #2

Friday, March 20, 2015

1. Indicate which of the following are true and which are false.

   (6 marks)

   (i)   True (False) All satisfiable sentences are logically equivalent. A , $-A$

   (ii)   True (False) No two unsatisfiable sentences are logically equivalent. $(A \wedge -A), (B \wedge -B)$

   (iii) True (False) All invalid sentences are logically equivalent. A , $(A \wedge -A)$

   (iv) (True) False   All valid sentences are logically equivalent. They all have the same truth values.

   (v)   True (False) All valid arguments have valid conclusions. $\dfrac{(A \wedge -A)}{B}$

   (vi) (True) False   Only invalid arguments have invalid conclusions.

2. For each of the sentences on the next page in List A find its correct symbolization from List B, given the following dictionary:

   (10 marks)

   T^1: –is a triangle; F^1: –is a figure; L^1: –is large; S^1: –is a circle

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List A:

(A$_1$) Every triangle is a figure.

(A$_2$) Some figures are not triangles.

(A$_3$) Some large figures are triangles.

(A$_4$) Some large figures are not triangles.

(A$_5$) Every figure is either a triangle or a circle.

(A$_6$) If all figures are triangles, then there are no circles. $\forall x (Fx \rightarrow Tx) \rightarrow \neg \exists x Sx$

(A$_7$) No circle is a triangle.

(A$_8$) If any circle is large, then some circle is large.

(A$_9$) If some circle is large, then any circle is large.

(A$_{10}$) Only triangles are large.

List B:

(B$_1$) $\exists x(Tx \wedge Fx)$

(B$_2$) $\forall x(Tx \rightarrow Fx)$ — Every triangle is a figure A1

(B$_3$) $\forall x(Lx \rightarrow Tx)$ — Only triangles are large A10

(B$_4$) $\neg \exists x(Sx \wedge Tx)$ — No circle is a triangle A7

(B$_5$) $\neg \exists x(Sx \rightarrow Tx)$

(B$_6$) $\exists x(Lx \wedge Fx \wedge \neg Tx)$ — Some large figures are triangles A4

(B$_7$) $(\forall x(Fx \rightarrow Tx) \rightarrow \neg \exists x Sx)$ — If all figures are triangles then there are no circles A6

(B$_8$) $(\forall x(Fx \wedge Tx) \rightarrow \neg \exists x Sx)$

(B$_9$) $\exists x(Lx \wedge Fx \wedge Tx)$ — Some Large figures are triangles A3

A8 →
A9 →
(B$_{10}$) $(\exists x(Sx \wedge Lx) \rightarrow \exists x(Sx \wedge Lx))$

(B$_{11}$) $(\exists x(Sx \wedge Lx) \rightarrow \forall x(Sx \rightarrow Lx))$

(B$_{12}$) $(\exists x(Sx \wedge Lx) \rightarrow \forall x(Lx \rightarrow Sx))$

(B$_{13}$) $\forall x(Fx \rightarrow (Tx \vee Sx))$ — Every figure is either a triangle or a circle A5

(B$_{14}$) $\forall x((Tx \vee Sx) \rightarrow Fx)$

(B$_{15}$) $\exists x(Fx \wedge \neg Tx)$ — Some figures are not triangles A2

Answer:

A$_1$	B2
A$_2$	B15
A$_3$	B9
A$_4$	B6
A$_5$	B13
A$_6$	B7
A$_7$	B4
A$_8$	B10
A$_9$	B11
A$_{10}$	B3

B10, B11 → ?

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3. For each of the following sentences specify an interpretation in which it is true, and another interpretation in which it is false.

(10 marks)

(i) $\exists x(Fx \wedge Gx)$

True:
Domain: {1, 2}
Ext. of F^1: {1,2}
Ext. of G^1: {1}

False:
Domain: {1, 2}
Ext. of F^1: ∅
Ext. of G^1: {1,2}

(ii) $\exists x(Fx \vee Gx)$

True:
Domain: {1, 2}
Ext. of F^1: {1}
Ext. of G^1: {2}

False:
Domain: {1, 2}
Ext. of F^1: ∅
Ext. of G^1: ∅

(iii) $\forall x(Fx \rightarrow Gx)$

True:
Domain: {1, 2}
Ext. of F^1: ∅
Ext. of G^1: {1,2}

False:
Domain: {1, 2}
Ext. of F^1: {1,2}
Ext. of G^1: ∅

(iv) $\forall x \exists y \, Lxy$

True:
Domain: {1, 2}
Ext. of L^2: {<1,2>,<2,1>}

False:
Domain: {1, 2}
Ext. of L^2: ∅

(v) $\exists y \forall x \, Lxy$
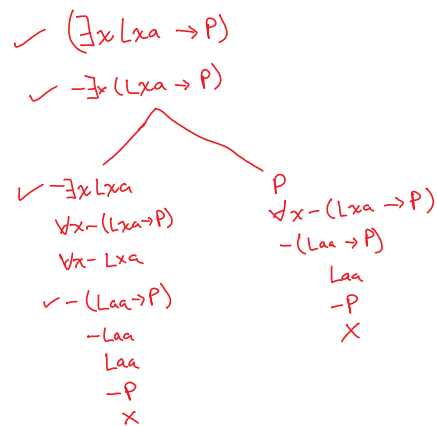
True:
Domain: {1, 2}
Ext. of L^2: {<1,1>, <2,1>}

False:
Domain: {1, 2}
Ext. of L^2: ∅

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4. Using the tree method test the following argument for validity. Identify a counterexample from an open path of a finished tree, if there is one.

(4 marks)

$$\frac{(\exists x Lxa \rightarrow P)}{\exists x(Lxa \rightarrow P)}$$

_____

Answer:

✓ $(\exists x Lxa \rightarrow P)$

✓ $\neg \exists x(Lxa \rightarrow P)$

Valid

✓ $\neg \exists x Lxa$
$\forall x \neg (Lxa \rightarrow P)$
$\forall x \neg Lxa$
✓ $\neg (Laa \rightarrow P)$
$\neg Laa$
Laa
$\neg P$
X

P
$\forall x \neg (Lxa \rightarrow P)$
$\neg (Laa \rightarrow P)$
Laa
$\neg P$
X

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