Philosophy 220   Final Exam   NAME_____

For the following items, circle which expressions of PL are correct sentences of PL (according to the rules of syntax for PL):

Klmnop   (∀a)Fa   (∀x)(∃x)(Fx & Gx)

(∀x)Fx & (∃x)Gx   Fa v Gbc   [(())(fvG&~

For the following items, circle the main logical operator of the sentence of PL, and specify whether the sentence is Atomic, Truth-Functional, or Quantified.

(∀x)(∃z)(Fz & Gx)   _____

~(∃y)Fy ⊃ Tb   _____

~(∃y)(Fy ⊃ Tb)   _____

Fgh   _____

Circle all that apply about the relations listed below:

x <u>is taller than</u> y   Reflexive   Symmetric   Transitive

x <u>loves</u> y   Reflexive   Symmetric   Transitive

x <u>is identical with</u> y   Reflexive   Symmetric   Transitive

x <u>contains</u> y   Reflexive   Symmetric   Transitive

Given the symbolization key below, determine whether the supplied sentences of PL are true or false.

UD: US Presidents
Dx: x is dead
Px: x was president
Lxy: x has a longer first name than y
a: Abraham Lincoln
b: Benjamin Harrison
c: Chester Arthur

____. Da & Lbc
____. ~Pb ⊃ Lac
____. (∃x)(Px & Dx)
____. Lca v Lbc

Given the following symbolization key, turn the below sentences of English into equivalent sentences Of PL

UD: Everything
Lxy: x is located in y
Bx: x brews beer
Oxy: x founded y
x=y: x is identical with y
b: Boston
c: Cambridge
e: Elijah Craig
k: Jim Koch
s: the Boston Beer Company
t: the Blue Sun Company
n(x): the closest company to x

The Boston Beer company is in Boston.

The Boston Beer company was founded by Jim Koch

Someone founded the Blue Sun Company

All of the breweries are either in Boston or Cambridge

The company that Elijah Craig founded is in Boston

The Blue Sun Company is the closest company to Boston

Given the following symbolization key, turn each of the sentences of PL into equivalent English sentences

UD: Logicians
Ex: x is English
Ax: x is Austrian
Gx: x is Greek
Cx: x is eccentric
Lx: x is a logician
Nxy: x annoys y
Rxy: x read y's book
x=y: x is identical with y
a: Aristotle
g: Gödel
l: Wittgenstein
r: Russell
t: Tarski
s(x): the student of x

Er & Ga

Ct ⊃ Ntg

(∀x)(Rxl & Rxa)

~(∀x)(Lx ⊃ Ex)

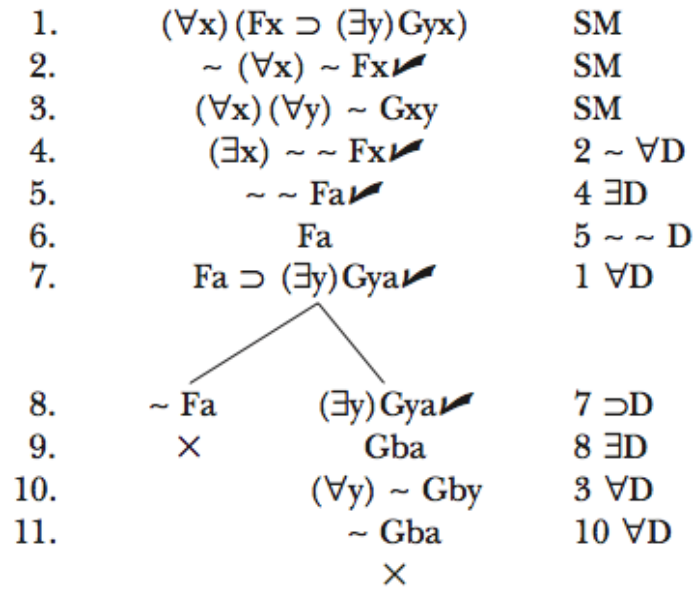~(∃z)(Az & Gz)

l=*s*(r)

 (∀y)(Ryr ⊃ y=g)

What information does this semantic tree contain? Circle all that apply.

1.	$(\forall x)(Fx \supset (\exists y)Gyx)$	SM
2.	$\sim (\forall x) \sim Fx$ ✓	SM
3.	$(\forall x)(\forall y) \sim Gxy$	SM
4.	$(\exists x) \sim \sim Fx$ ✓	$2 \sim \forall D$
5.	$\sim \sim Fa$ ✓	$4\ \exists D$
6.	Fa	$5 \sim \sim D$
7.	$Fa \supset (\exists y)Gya$ ✓	$1\ \forall D$

8.	$\sim Fa$	$(\exists y)Gya$ ✓	$7 \supset D$
9.	✗	Gba	$8\ \exists D$
10.		$(\forall y) \sim Gby$	$3\ \forall D$
11.		$\sim Gba$	$10\ \forall D$
		✗	

$\{(\forall x)(Fx \supset (\exists y)Gyx), \sim(\forall x)\sim Fx, (\forall x)(\forall y)\sim Gxy\}$ is consistent
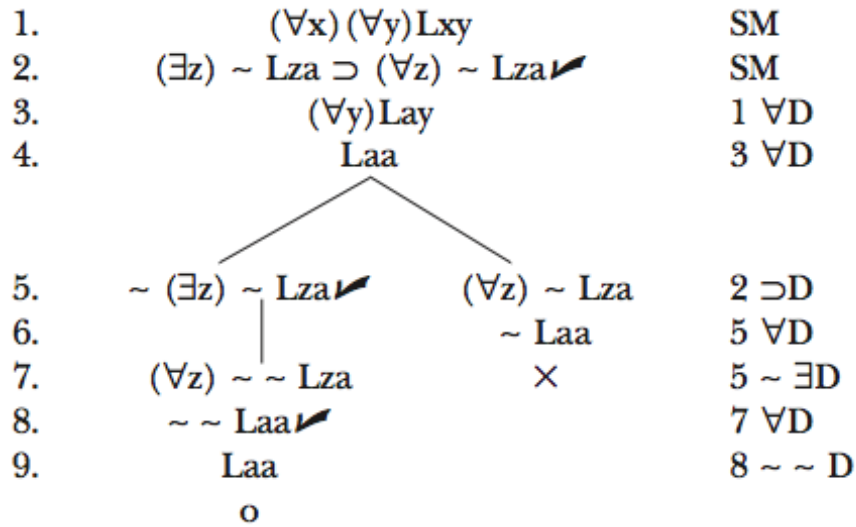
$\{(\forall x)(Fx \supset (\exists y)Gyx), \sim(\forall x)\sim Fx\}$ entails $(\forall x)(\forall y)\sim Gxy$

$\{(\forall x)(Fx \supset (\exists y)Gyx), (\forall x)(\forall y)\sim Gxy \}$ entails $(\forall x)\sim Fx$

$(\forall x)(Fx \supset (\exists y)Gyx), \sim(\forall x)\sim Fx\}$, and $(\forall x)(\forall y)\sim Gxy$ are all equivalent

What information does this semantic tree contain? Circle all that apply.

1.	$(\forall x)(\forall y)Lxy$	SM
2.	$(\exists z) \sim Lza \supset (\forall z) \sim Lza$ ✔	SM
3.	$(\forall y)Lay$	1 $\forall$D
4.	Laa	3 $\forall$D

5.	$\sim (\exists z) \sim Lza$ ✔ $(\forall z) \sim Lza$		2 $\supset$D
6.	$\sim Laa$		5 $\forall$D
7.	$(\forall z) \sim \sim Lza$ $\times$		5 $\sim \exists$D
8.	$\sim \sim Laa$ ✔		7 $\forall$D
9.	Laa		8 $\sim \sim$ D
	o		

{($\exists z$)~Lza) $\supset$ ($\forall z$)~Lza, ($\forall x$)($\forall y$)Lxy} is consistent

[($\exists z$)~Lza) $\supset$ ($\forall z$)~Lza] & [($\forall x$)($\forall y$)Lxy] is not a contradiction

{($\exists z$)~Lza) $\supset$ ($\forall z$)~Lza is not a contradiction

~($\forall x$)($\forall y$)Lxy is not a contradiction

*What is **true** of the following tree? Circle all that apply.*

1.	$(\exists x)Hx$ ✔	SM
2.	$\sim(\forall x)Hx$ ✔	SM
3.	$(\forall x)(Hx \supset Kx)$	SM
4.	$(\exists x)(Kx \ \& \ Hx)$ ✔	SM
5.	$(\exists x)\sim Hx$ ✔	$2 \sim \forall D$
6.	$Ka \ \& \ Ha$ ✔	$4 \ \exists D2$
7.	Ka	$6 \ \& D$
8.	Ha	$6 \ \& D$

9.   Ha   Hb $1 \ \exists D2$

10.	$\sim Ha$	$\sim Hb$	$\sim Ha$	$\sim Hb$	$\sim Hc$	$5 \ \exists D2$
11.	$\times$	$Ha \supset Ka$ ✔	$\times$	$\times$	$Ha \supset Ka$ ✔	$3 \ \forall D$
12.		$Hb \supset Kb$ ✔			$Hb \supset Kb$ ✔	$3 \ \forall D$
13.					$Hc \supset Kc$	$3 \ \forall D$

14. $\sim Ha$ Ka $\sim Ha$ Ka $11 \supset D$
            $\times$ $\times$

15. $\sim Hb$ Kb $\sim Hb$ Kb $12 \supset D$
            o   o $\times$ ⋮
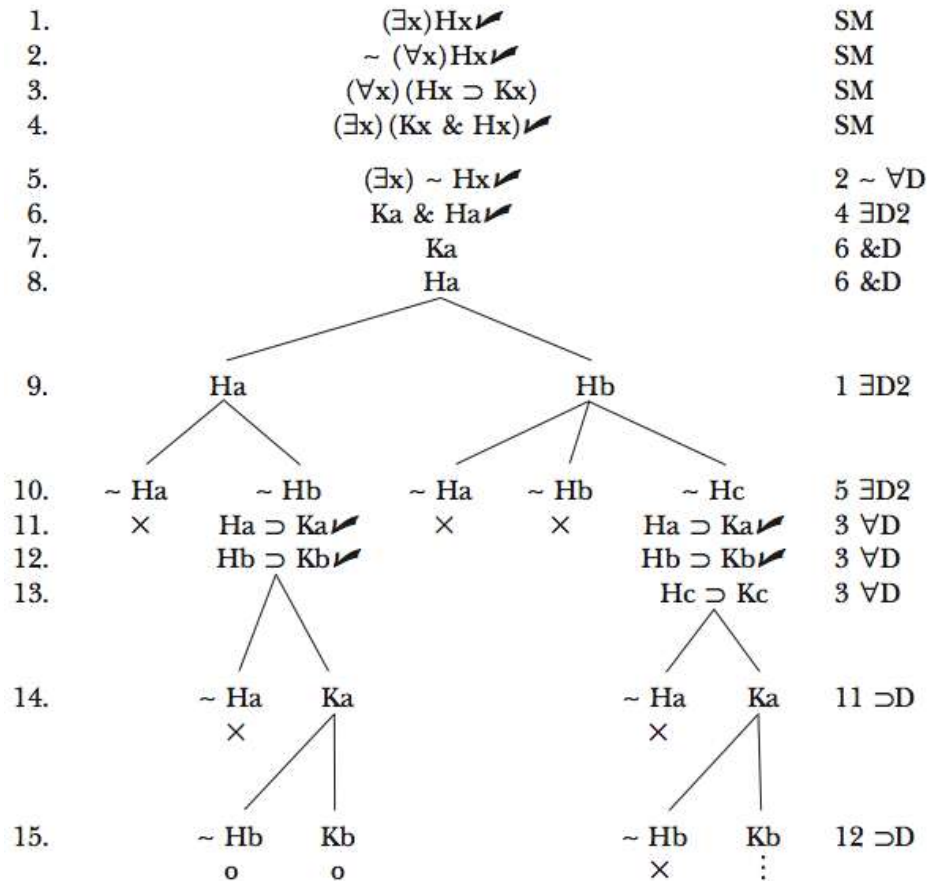
This is a systematic tree.

This tree has more than one non-terminating branch.

The set tested in this tree is consistent.

This tree is closed.

This tree has more than one completed open branch.

Using the space provided, complete the following semantic tree (be sure to justify each line):

      1. $(\forall x)(Hx \equiv \sim Ix)$ SM
      2. $\sim(\exists x)\sim Ix$ SM
      3. $\sim(\forall x)\sim Hx$ SM

Using the space provided, complete the following semantic tree (be sure to justify each line):

1. ~($\exists$x)(Bx v Cxa)   SM
2. ($\forall$w)(Dw & ($\exists$y)Cwy)   SM