

Problem Set 1
PHIL 2006 Logic for Philosophers 1
Due: 16 February 2011 by 4:00PM

Name _____

Chun

Student ID Number _____

Answer Key

Submit your problem set to Ms. Loletta Li in Main Building 312.
Make sure your problem set is timestamped.
Do not submit assignments by email.
Late penalty: 10% for each day late.
This problem set will not be accepted after 21 February.
Answer the questions on the problem set itself. Write neatly.
If the grader cannot read your handwriting, you will not receive credit.
Be sure that all pages of the assignment are securely stapled together.
Check the course bulletin board for announcements about the assignment.
Do your own work.
If you copy your problem set, or permit others to copy, you may fail the course.

1. (15 marks) *True or false?*

Circle 'T' if the statement is true. Circle 'F' if the statement is false.

For this question, you should assume that φ is a WFF of SL.

- T F The main connective of " $\sim(A \& \sim B)$ " is "&".
- T F The conclusion of a sound argument cannot be false.
- T F "The father and the child" is a statement.
- T F Some WFF of SL contains exactly 371 symbols.
- T F Some valid arguments are not good arguments.
- T F No argument with a false conclusion is valid.
- T F Whenever " $(A \leftrightarrow B)$ " is true, " $(A \rightarrow B)$ " is also true.
- T F If φ contains the symbol "(" then φ contains a two-place connective.
- T F Logic is a science which explains how people actually reason.
- T F If the premises of an argument are all true, then the argument is valid.

1.5 each

/15

2. (15 marks)

Make a correct truth table for each of the following WFFs of SL.

a. $((A \leftrightarrow \sim E) \& B)$

| A | E | B | $((A \leftrightarrow \sim E) \& B)$ |
|---|---|---|-------------------------------------|
| T | T | T | F |
| T | T | F | F |
| T | F | T | T |
| T | F | F | F |
| F | T | T | F |
| F | T | F | F |
| F | F | T | T |
| F | F | F | F |

b. $((A \leftrightarrow B) \rightarrow \sim A)$

| A | B | $((A \leftrightarrow B) \rightarrow \sim A)$ |
|---|---|--|
| T | T | F |
| T | F | T |
| F | T | T |
| F | F | T |

c. $((\sim D \& B) \rightarrow (D \& \sim B))$

| D | B | $((\sim D \& B) \rightarrow (D \& \sim B))$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | F |
| F | F | T |

d. $((B \rightarrow Q) \vee \sim A)$

| B | Q | A | $((B \rightarrow Q) \vee \sim A)$ |
|---|---|---|-----------------------------------|
| T | T | T | T |
| T | T | F | T |
| T | F | T | F |
| T | F | F | T |
| F | T | T | T |
| F | T | F | T |
| F | F | T | T |
| F | F | F | T |

e. $((A \vee \sim Q) \vee \sim A)$

| A | Q | $((A \vee \sim Q) \vee \sim A)$ |
|---|---|---------------------------------|
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | T |

3 marks each

/15

3. (16 marks)

Fill in the blanks with an SL WFF to make correct truth tables.

Each WFF must contain exactly four two-place connectives.

a.

| A | B | $((\sim A \& B) \& ((A \vee \sim A) \vee \sim A))$ |
|---|---|--|
| T | T | F |
| T | F | F |
| F | T | T |
| F | F | F |

b.

| P | Q | R | $(((P \vee \sim P) \vee Q) \& (P \rightarrow R))$ |
|---|---|---|---|
| T | T | T | T |
| T | T | F | F |
| T | F | T | T |
| T | F | F | F |
| F | T | T | T |
| F | T | F | T |
| F | F | T | T |
| F | F | F | T |

c.

| D | H | S | $((H \& \sim S) \vee ((\sim D \& \sim H) \& \sim S))$ |
|---|---|---|---|
| T | T | T | F |
| T | T | F | T |
| T | F | T | F |
| T | F | F | F |
| F | T | T | F |
| F | T | F | T |
| F | F | T | F |
| F | F | F | T |

d.

| P | $((P \& \sim P) \& ((P \& \sim P) \& P))$ |
|---|---|
| T | F |
| F | F |

4 marks each

/16

6. (12 marks)

Translate the following statements into SL.

Preserve as much structure as possible.

Use the following translation scheme:

P: China is far.

Q: Denmark is flat.

R: Brazil is near.

S: France is near.

(a) China is not far only if neither France nor Brazil is near.

$$(\sim P \rightarrow (\sim S \& \sim R))$$

(b) France is near, although Brazil is not.

$$(S \& \sim R)$$

(c) If Denmark is flat, then either both France and Brazil are near or neither one is.

$$(Q \rightarrow ((S \& R) \vee (\sim S \& \sim R)))$$

(d) Whether or not Denmark is flat, China is far.

$$((Q \vee \sim Q) \rightarrow P) \text{ or } ((Q \rightarrow P) \& (\sim Q \rightarrow P))$$

/12

7. (5 marks)

3 marks each

Suppose that at least one of the following two statements is **false**:

If freedom is possible, then love is not possible.

Either love is not possible or hatred is possible.

Translate each of the two statements into SL, preserving as much structure as possible.

Be sure to write down your translation scheme.

F: Freedom is possible

L: Love is possible

H: Hatred is possible

$$\left. \begin{array}{l} (F \rightarrow \sim L) \\ (\sim L \vee H) \end{array} \right\} \text{ 3 marks}$$

Is love possible?

Love is possible

2 marks /5

8. (12 marks)

Two of the following three statements are false and one is true:

Lola and Harry both eat only if the potatoes are not spicy.

If Harry does not eat, then the rice is cooked, but if the rice is cooked then Harry does not eat.

If Lola eats then the rice is not cooked.

1. Translate each of the three statements into SL, preserving as much structure as possible. Be sure to write down your translation scheme.

L: Lola eats $((L \& H) \rightarrow \sim P)$
H: Harry eats $((\sim H \rightarrow R) \& (R \rightarrow \sim H))$
P: The potatoes are spicy $(L \rightarrow \sim R)$
R: The rice is cooked

2. Which one of the three statements is true?

(If there is not enough information to answer the question, explain why.)

$((L \& H) \rightarrow \sim P)$

3. Are the potatoes spicy?

(If there is not enough information to answer the question, explain why.)

Noe spicy

4 marks each

/12

9. (10 marks)

For each of the following:

Circle "tautology" if it is a WFF of SL that is a tautology.

Circle "contingent" if it is a contingent WFF of SL.

Circle "inconsistent" if it is an inconsistent WFF of SL.

Otherwise, don't circle anything.

| | | | | |
|-----------|--|------------|--------------|-----------------|
| tautology | $(\sim P \rightarrow (Q \rightarrow P)) \& R$ | contingent | inconsistent | <i>not wff,</i> |
| tautology | $(P \leftrightarrow (R \leftrightarrow P)) \& B$ | contingent | inconsistent | <i>not wff,</i> |
| tautology | $((P \vee \sim Q) \rightarrow \sim P)$ | contingent | inconsistent | |
| tautology | $((\sim P \rightarrow (Q \rightarrow R)) \vee ((Q \rightarrow R) \rightarrow P))$ | contingent | inconsistent | |
| tautology | $((\sim P \rightarrow \sim Q) \& ((\sim Q \leftrightarrow P) \& (R \rightarrow R)))$ | contingent | inconsistent | |
| tautology | $((P \leftrightarrow Q) \leftrightarrow ((P \vee R) \leftrightarrow (P \& R)))$ | contingent | inconsistent | |
| tautology | $((P \rightarrow \sim Q) \& ((\sim Q \rightarrow P) \vee (P \rightarrow Q)))$ | contingent | inconsistent | |
| tautology | $(\sim R \rightarrow ((P \& Q) \rightarrow (R \vee P)))$ | contingent | inconsistent | |
| tautology | $((P \rightarrow P) \vee (Q \rightarrow \sim Q))$ | contingent | inconsistent | |
| tautology | $((\sim P \& (Q \& R)) \rightarrow (P \vee R))$ | contingent | inconsistent | |

(mark each)

/10

