Problem Set 1
Phil 2008: Logic for Philosophers 2
Due: 22 February

Name:_____

Student ID Number:_____

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.~~ **IGNORE THIS**
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.

Show the following:

1. $(A \& (B \& C)) \vdash ((A \& B) \& C)$

1	1. $(A \& (B \& C))$	A
1	2. A	1 &E
1	3. $(B \& C)$	1 &E
1	4. B	3 &E
1	5. C	3 &E
1	6. $(A \& B)$	2,4 &I
1	7. $((A \& B) \& C)$	6,5 &I

2. $(P \rightarrow (Q \rightarrow R)) \vdash ((P \& Q) \rightarrow R$

1	1. $(P \rightarrow (Q \rightarrow R))$	A
2	2. $(P \& Q)$	A
2	3. P	2 &E
2	4. Q	2 &E

1,2	5. (Q → R)	1,3 →E
1,2	6. R	5,4 →E
1	7. ((P & Q) → R)	2,6 →I

3. (P → (P → Q)), P ├ Q

1	1. (P → (P → Q))	A
2	2. P	A
1,2	3. (P → Q)	1,2 →E
1,2	4. Q	3,2 →E

4. (A ↔ B), (B ↔ C) ├ (A ↔ C)

1	1. (A ↔ B)	A
2	2. (B ↔ C)	A
1	3. ((A → B) & (B → A))	1 ↔E
2	4. ((B → C) & (C → B))	2 ↔E
1	5. (A → B)	3 &E
1	6. (B → A)	3 &E
2	7. (B → C)	4 &E
2	8. (C → B)	4 &E
9	9. A	A
1,9	10. B	5,9 →E
1,2,9	11. C	7,10 →E
1,2	12. (A → C)	9,11 →I
13	13. C	A
2,13	14. B	8,13 →E
1,2,13	15. A	6,14 →E
1,2	16. (C → A)	13,15 →I
1,2	17. ((A → C) & (C → A))	12,16 &I
1,2	18. (A ↔ C)	17 ↔I

5. (P & (P ↔ Q)) ├ (P & Q)

1	1. (P & (P ↔ Q))	A
1	2. P	1 &E
1	3. (P ↔ Q)	1 &E
1	4. ((P → Q) & (Q → P))	3 ↔E
1	5. (P → Q)	4 &E
1	6. Q	5,2 →E

1	7. (P & Q)	2,6 &I

6. (P → (Q → (R → S))) ├ (R → (P → (Q → S)))

1	1. (P → (Q → (R → S)))	A
2	2. P	A
3	3. Q	A
4	4. R	A
1,2	5. (Q → (R → S))	1,2 →E
1,2,3	6. (R → S)	5,3 →E
1,2,3,4	7. S	6,4 →E
1,2,4	8. (Q → S)	3,7 →I
1,4	9. (P → (Q → S))	2,8 →I
1	10. (R → (P → (Q → S)))	4,9 →I

7. P ├ (Q → (P & Q))

1	1. P	A
2	2. Q	A
1,2	3. (P & Q)	1,2 &I
1	4. (Q → (P & Q))	2,3 →I

8. (P & Q) ├ (P v Q)

1	1. (P & Q)	A
1	2. P	1 &E
1	3. (P v Q)	2 vI

9. ├ ((A v B) → (~B → A))

1	1. (A v B)	A
2	2. ~B	A
1,2	3. A	1,2 vE
1	4. (~B → A)	2,3 →I
	5. ((A v B) → (~B → A))	1,4 →I

10. (P v Q) ├ (Q v P)

1	1. (P v Q)	A
2	2. ~(Q v P)	A

3	3. ~Q	A
1,3	4. P	1,3 vE
1,3	5. (Q v P)	4 vI
1,2,3	6. ((Q v P) & ~(Q v P))	5,2 &I
1,2	7. Q	3,6 ~E
1,2	8. (Q v P)	7 vI
1,2	9. ((Q v P) & ~(Q v P))	8,2 &I
1	10. (Q v P)	2,9 ~E