

1.

$A \rightarrow C \vdash (A \wedge B) \rightarrow C$



1.	$A \rightarrow C$:PR	+
2.	$A \wedge B$:AS	+
3.	A	: \wedge E 2	+
4.	C	: \rightarrow E 1,3	+
5.	$(A \wedge B) \rightarrow C$: \rightarrow I 2-4	+

Submit

1.	$A \rightarrow C$	PR
2.	$A \wedge B$	AS
3.	A	\wedge E 2
4.	C	\rightarrow E 1, 3
5.	$(A \wedge B) \rightarrow C$	\rightarrow I 2-4

2.

$\neg A \vdash \neg(A \wedge B)$

1.

Submit

3.

$(A \wedge B) \rightarrow C \vdash A \rightarrow (B \rightarrow C)$



1.	$(A \wedge B) \rightarrow C$:PR	+
2.	A	:AS	+
3.	B	:AS	+
4.	$A \wedge B$	$\wedge I$ 2,3	+
5.	C	$\rightarrow E$ 1,4	+
6.	$B \rightarrow C$	$\rightarrow I$ 3-5	+
7.	$A \rightarrow (B \rightarrow C)$	$\rightarrow I$ 2-6	+

Submit

1.	$(A \wedge B) \rightarrow C$	PR
2.	A	AS
3.	B	AS
4.	$A \wedge B$	$\wedge I$ 2, 3
5.	C	$\rightarrow E$ 1, 4
6.	$B \rightarrow C$	$\rightarrow I$ 3-5
7.	$A \rightarrow (B \rightarrow C)$	$\rightarrow I$ 2-6

4.

$\neg(A \vee B) \vdash \neg A \wedge \neg B$



1.	$\sim(A \vee B)$:PR	+
2.	A	:AS	+
3.	$A \vee B$: \vee I 2	+
4.	!?	: \sim E 1,3	+
5.	$\sim A$: \sim I 2-4	+
6.	B	:AS	+
7.	$A \vee B$: \vee I 6	+
8.	!?	: \sim E 1,7	+
9.	$\sim B$: \sim I 6-8	+
10.	$\sim A \wedge \sim B$: \wedge I 5,9	+

Submit

1.	$\neg(A \vee B)$	PR
2.	A	AS
3.	$A \vee B$	\vee I 2
4.	\perp	\neg E 1, 3
5.	$\neg A$	\neg I 2-4
6.	B	AS
7.	$A \vee B$	\vee I 6
8.	\perp	\neg E 1, 7
9.	$\neg B$	\neg I 6-8
10.	$\neg A \wedge \neg B$	\wedge I 5, 9

5.

$\neg A \wedge \neg B \vdash \neg(A \vee B)$

1.

Submit

6.

$(A \wedge B) \vee (C \wedge D) \vdash A \vee C$

✓

1.	$(A \wedge B) \vee (C \wedge D)$:PR	+
2.	$A \wedge B$:AS	+
3.	A	: \wedge E 2	+
4.	$A \vee C$: \vee I 3	+
5.	--		
6.	$C \wedge D$:AS	+
7.	C	: \wedge E 6	+
8.	$A \vee C$: \vee I 7	+
9.	$A \vee C$: \vee E 1, 2-4, 6-8	+

Submit

1.	$(A \wedge B) \vee (C \wedge D)$	PR
2.	$A \wedge B$	AS
3.	A	\wedge E 2
4.	$A \vee C$	\vee I 3
6.	$C \wedge D$	AS
7.	C	\wedge E 6
8.	$A \vee C$	\vee I 7
9.	$A \vee C$	\vee E 1, 2-4, 6-8

7.

$A \vee \neg(B \wedge C) \vdash A \vee \neg B$

1.

Submit

8.

 $\top \vdash A \rightarrow ((A \rightarrow B) \rightarrow A)$

✓

1.	A	:AS	+
2.	A \rightarrow B	:AS	+
3.	A	:R 1	+
4.	(A \rightarrow B) \rightarrow A	: \rightarrow I 2-3	+
5.	A \rightarrow ((A \rightarrow B) \rightarrow A)	: \rightarrow I 1-4	+

Submit

1.	A	AS
2.	A \rightarrow B	AS
3.	A	R 1
4.	(A \rightarrow B) \rightarrow A	\rightarrow I 2-3
5.	A \rightarrow ((A \rightarrow B) \rightarrow A)	\rightarrow I 1-4

9.

 $\top \vdash A \vee \neg A$

✓

1.	$\neg(A \vee \neg A)$:AS	+
2.	A	:AS	+
3.	A \vee $\neg A$: \vee I 2	+
4.	!?	: \neg E 1,3	+
5.	$\neg A$: \neg I 2-4	+
6.	A \vee $\neg A$: \vee I 5	+
7.	!?	: \neg E 1,6	+
8.	A \vee $\neg A$:IP 1-7	+

Submit

1.	$\neg(A \vee \neg A)$	AS
2.	A	AS
3.	A \vee $\neg A$	\vee I 2
4.	\perp	\neg E 1, 3
5.	$\neg A$	\neg I 2-4
6.	A \vee $\neg A$	\vee I 5
7.	\perp	\neg E 1, 6
8.	A \vee $\neg A$	IP 1-7

