Suin Kim
CS270-002

CS270 Deduction Homework

Question 1:

Proof:

Construct a proof for the argument: $A \wedge B \therefore B \wedge A$

1	$A \wedge B$	
2	A	$\wedge$E 1
3	B	$\wedge$E 1
4	$B \wedge A$	$\wedge$I 2, 3

NEW LINE NEW SUBPROOF

☺ Congratulations! This proof is correct.

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Question 2:

Proof:

Construct a proof for the argument: $A \vee B \therefore B \vee A$

1	$A \vee B$	
2	$\quad A$	
3	$\quad B \vee A$	$\vee$I 2
4	$\quad B$	
5	$\quad B \vee A$	$\vee$I 4
6	$B \vee A$	$\vee$E 1, 2–3, 4–5

NEW LINE NEW SUBPROOF

☺ Congratulations! This proof is correct.

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Question 3:

Proof:

Construct a proof for the argument: $A \vee (B \wedge C) \therefore (A \vee B) \wedge (A \vee C)$

1	$A \vee (B \wedge C)$	
2	$\quad A$	
3	$\quad A \vee B$	∨I 2
4	$\quad A \vee C$	∨I 2
5	$\quad (A \vee B) \wedge (A \vee C)$	∧I 3, 4
6	$\quad B \wedge C$	
7	$\quad B$	∧E 6
8	$\quad C$	∧E 6
9	$\quad A \vee B$	∨I 7
10	$\quad A \vee C$	∨I 8
11	$\quad (A \vee B) \wedge (A \vee C)$	∧I 9, 10
12	$(A \vee B) \wedge (A \vee C)$	∨E 1, 2–5, 6–11

NEW LINE NEW SUBPROOF

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Question 4:

Proof:

Construct a proof for the argument: $(A \wedge B) \vee (A \wedge C) \therefore A \wedge (B \vee C)$

1	$(A \wedge B) \vee (A \wedge C)$	
2	$A \wedge B$	
3	A	∧E 2
4	B	∧E 2
5	$B \vee C$	∨I 4
6	$A \wedge (B \vee C)$	∧I 3, 5
7	$A \wedge C$	
8	A	∧E 7
9	C	∧E 7
10	$B \vee C$	∨I 9
11	$A \wedge (B \vee C)$	∧I 8, 10
12	$A \wedge (B \vee C)$	∨E 1, 2–6, 7–11

NEW LINE NEW SUBPROOF

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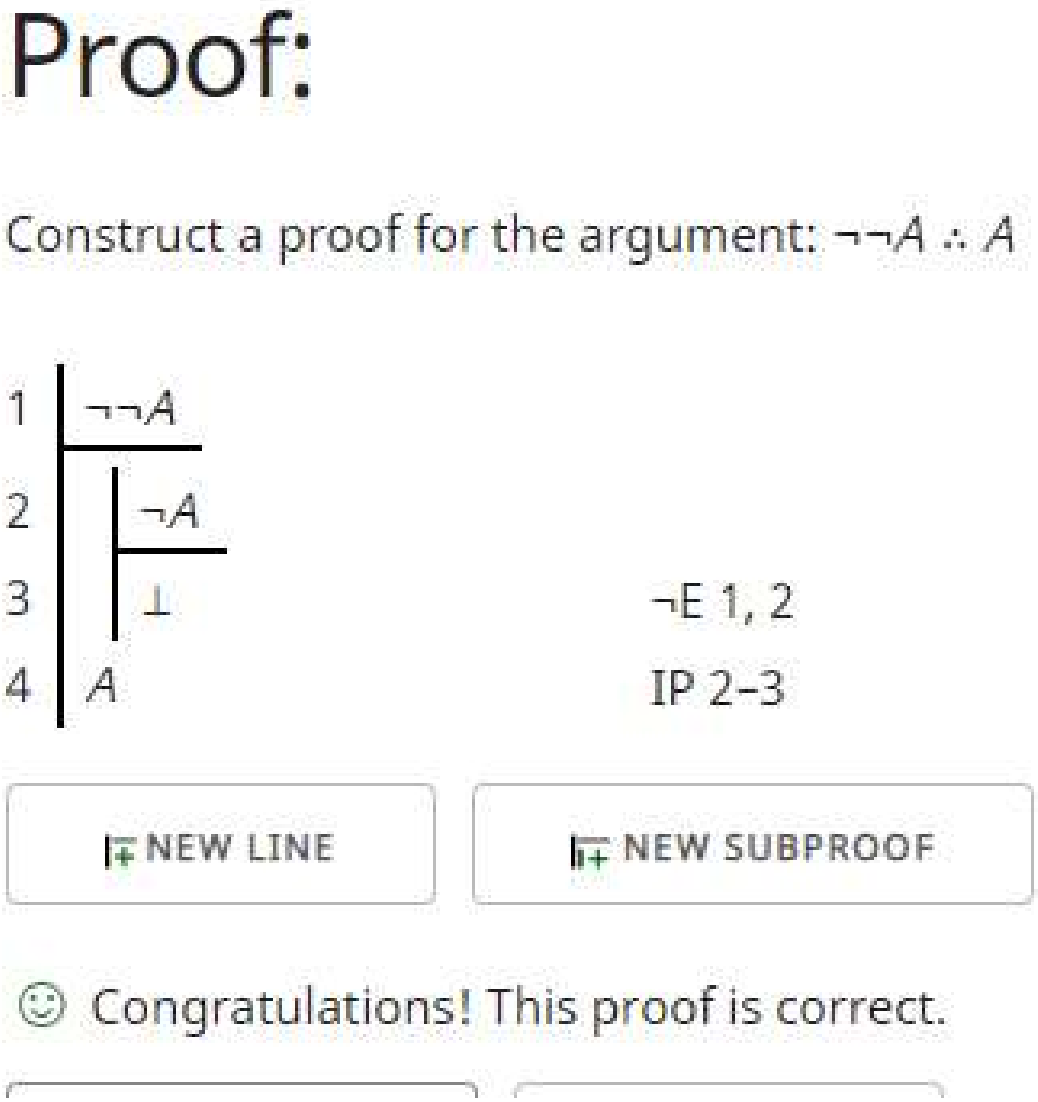
Question 5:



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Question 6:

Proof:

Construct a proof for the argument: $A \therefore \neg\neg A$

1	A		
2	$\quad \neg A$		
3	$\quad \bot$	$\neg$E 1, 2	
4	$\neg\neg A$	$\neg$I 2–3	

NEW LINE NEW SUBPROOF

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Question 7:

Proof:

Construct a proof for the argument: $A \rightarrow B \therefore \neg A \vee B$

1	$A \rightarrow B$	
2	$\neg(\neg A \vee B)$	
3	$\neg A$	
4	$\neg A \vee B$	∨I 3
5	$\bot$	⊥I 2, 4
6	A	IP 3–5
7	B	→E 1, 6
8	$\neg A \vee B$	∨I 7
9	$\bot$	⊥I 2, 8
10	$\neg A \vee B$	IP 2–9

NEW LINE NEW SUBPROOF

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Question 8:

Proof:

Construct a proof for the argument: $\neg A \vee B \therefore A \rightarrow B$

1	$\neg A \vee B$	
2	A	
3	$\neg A$	
4	$\bot$	¬E 2, 3
5	B	X 4
6	B	
7	$B \wedge B$	∧I 6, 6
8	B	∧E 7
9	B	∨E 1, 3–5, 6–8
10	$A \rightarrow B$	→I 2–9

NEW LINE NEW SUBPROOF

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Question 9:

Proof:

Construct a proof for the argument: $\neg(A \wedge B) \therefore \neg A \vee \neg B$

1	$\neg(A \wedge B)$	
2	$\neg(\neg A \vee \neg B)$	
3	$\neg A$	
4	$\neg A \vee \neg B$	∨I 3
5	$\perp$	⊥I 2, 4
6	A	IP 3–5
7	$\neg B$	
8	$\neg A \vee \neg B$	∨I 7
9	$\perp$	⊥I 2, 8
10	B	IP 7–9
11	$A \wedge B$	∧I 6, 10
12	$\perp$	⊥I 1, 11
13	$\neg A \vee \neg B$	IP 2–12

NEW LINE NEW SUBPROOF

☺ Congratulations! This proof is correct.