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CST 329
Module 5 HW Proofs

hw8.3, hw8.4, hw8.5, hw8.6, hw8.7, hw10.1, hw10.2 (check at the top of the repository problem list for hw10).

8.3

Check Your Proof:

Proof: Repository - hw8.3

Construct a proof for the argument: $P \rightarrow Q \therefore \neg P \vee Q$

1	$P \rightarrow Q$	
2	$\neg(\neg P \vee Q)$	
3	$\neg P$	
4	$\neg P \vee Q$	3 Addition
5	$\neg(\neg P \vee Q)$	2 Repeat
6	P	3–5 Reductio Ad Absurdum
7	Q	1, 6 Modus Ponens
8	$\neg P \vee Q$	7 Addition
9	$\neg(\neg P \vee Q)$	2 Repeat
10	$\neg P \vee Q$	2–9 Reductio Ad Absurdum

new line new subproof

Congratulations! This proof is correct.

check proof start over

Clear & Start a new Proof

8.4

Check Your Proof:

Proof: Repository - hw8.4

Construct a proof for the argument: $\neg(R \vee S), P \rightarrow R, Q \rightarrow S \therefore \neg(P \vee Q)$

1	$\neg(R \vee S)$	
2	$P \rightarrow R$	
3	$Q \rightarrow S$	
4	$\neg\neg(P \vee Q)$	
5	$P \vee Q$	4 Double Negation
6	$\neg P$	
7	Q	5, 6 Modus Tollendo Ponens
8	S	3, 7 Modus Ponens
9	$R \vee S$	8 Addition
10	$\neg(R \vee S)$	1 Repeat
11	P	6–10 Reductio Ad Absurdum
12	R	2, 11 Modus Ponens
13	$R \vee S$	12 Addition
14	$\neg(R \vee S)$	1 Repeat
15	$\neg(P \vee Q)$	4–14 Reductio Ad Absurdum

new line new subproof

Congratulations! This proof is correct.

check proof start over

8.5

Proof: Repository - hw8.5

Construct a proof for the argument: $P \wedge (Q \vee R) \therefore (P \wedge Q) \vee (P \wedge R)$

1	$P \wedge (Q \vee R)$	
2	$\neg((P \wedge Q) \vee (P \wedge R))$	
3	$P \wedge Q$	
4	$(P \wedge Q) \vee (P \wedge R)$	3 Addition
5	$(P \wedge Q) \rightarrow ((P \wedge Q) \vee (P \wedge R))$	3–4 Conditional derivation
6	$\neg(P \wedge Q)$	2, 5 Modus Tollens
7	$\neg\neg Q$	
8	Q	7 Double Negation
9	P	1 Simplification
10	$P \wedge Q$	8, 9 Adjunction
11	$\neg(P \wedge Q)$	6 Repeat
12	$\neg Q$	7–11 Reductio Ad Absurdum
13	$Q \vee R$	1 Simplification
14	R	12, 13 Modus Tollendo Ponens
15	P	1 Simplification
16	$P \wedge R$	14, 15 Adjunction
17	$(P \wedge Q) \vee (P \wedge R)$	16 Addition
18	$\neg((P \wedge Q) \vee (P \wedge R))$	2 Repeat
19	$(P \wedge Q) \vee (P \wedge R)$	2–18 Reductio Ad Absurdum

new line new subproof

Congratulations! This proof is correct.

check proof start over

Click to go back, hold to see h

8.6

Check Your Proof:

Proof: Repository - hw8.6

Construct a proof for the argument: $\therefore \neg[(P \rightarrow \neg P) \wedge (\neg P \rightarrow P)]$

1	$\neg\neg((P \rightarrow \neg P) \wedge (\neg P \rightarrow P))$	
2	$(P \rightarrow \neg P) \wedge (\neg P \rightarrow P)$	1 Double Negation
3	$P \rightarrow \neg P$	2 Simplification
4	$\neg P \rightarrow P$	2 Simplification
5	$P \leftrightarrow \neg P$	3, 4 Bicondition
6	$\neg\neg P$	
7	P	6 Double Negation
8	$\neg P$	3, 7 Modus Ponens
9	$\neg P$	6–8 Reductio Ad Absurdum
10	P	4, 9 Modus Ponens
11	$\neg((P \rightarrow \neg P) \wedge (\neg P \rightarrow P))$	1–10 Reductio Ad Absurdum

new line new subproof

Congratulations! This proof is correct.

check proof start over

Clear & Start a new Proof

8.7

Check Your Proof:

Proof: Repository - hw8.7

Construct a proof for the argument: $\therefore (\neg P \vee \neg Q) \leftrightarrow \neg(P \wedge Q)$

1	$\neg(P \wedge Q)$	
2	$\neg(\neg P \vee \neg Q)$	
3	$\neg P$	
4	$\neg P \vee \neg Q$	3 Addition
5	$\neg(\neg P \vee \neg Q)$	2 Repeat
6	P	3–5 Reductio Ad Absurdum
7	$\neg Q$	
8	$\neg P \vee \neg Q$	7 Addition
9	$\neg(\neg P \vee \neg Q)$	2 Repeat
10	Q	7–9 Reductio Ad Absurdum
11	$P \wedge Q$	6, 10 Adjunction
12	$\neg(P \wedge Q)$	1 Repeat
13	$(\neg P \vee \neg Q)$	2–12 Reductio Ad Absurdum
14	$\neg(P \wedge Q) \rightarrow (\neg P \vee \neg Q)$	1–13 Conditional derivation
15	$\neg P \vee \neg Q$	
16	$\neg\neg(P \wedge Q)$	
17	$P \wedge Q$	16 Double Negation
18	P	17 Simplification
19	$\neg\neg P$	18 Double Negation
20	$\neg Q$	15, 19 Modus Tollendo Ponens
21	Q	17 Simplification
22	$\neg(P \wedge Q)$	16–21 Reductio Ad Absurdum
23	$(\neg P \vee \neg Q) \rightarrow \neg(P \wedge Q)$	15–22 Conditional derivation
24	$(\neg P \vee \neg Q) \leftrightarrow \neg(P \wedge Q)$	14, 23 Bicondition

new line new subproof

Congratulations! This proof is correct.

check proof start over

10.1

Check Your Proof:

Proof: Repository - hw10.1

Construct a proof for the argument: $\therefore \neg(P \rightarrow Q) \rightarrow (P \rightarrow \neg Q)$

1	$\neg(P \rightarrow Q)$	
2	P	
3	$\neg\neg Q$	
4	P	
5	Q	3 Double Negation
6	$P \rightarrow Q$	4–5 Conditional derivation
7	$\neg(P \rightarrow Q)$	1 Repeat
8	$\neg Q$	3–7 Reductio Ad Absurdum
9	$P \rightarrow \neg Q$	2–8 Conditional derivation
10	$\neg(P \rightarrow Q) \rightarrow (P \rightarrow \neg Q)$	1–9 Conditional derivation

new line | new subproof

Congratulations! This proof is correct.

check proof | start over

Clear & Start a new Proof

10.2

Check Your Proof:

Proof: Repository - hw10.2

Construct a proof for the argument: $\therefore (P \leftrightarrow \neg Q) \rightarrow \neg(P \leftrightarrow Q)$

1	$P \leftrightarrow \neg Q$	
2	$\neg\neg(P \leftrightarrow Q)$	
3	$P \leftrightarrow Q$	2 Double Negation
4	$\neg\neg P$	
5	P	4 Double Negation
6	Q	3, 5 Equivalence
7	$\neg Q$	1, 5 Equivalence
8	$\neg P$	4–7 Reductio Ad Absurdum
9	$\neg\neg Q$	
10	Q	9 Double Negation
11	P	3, 10 Equivalence
12	$\neg P$	8 Repeat
13	$\neg Q$	9–12 Reductio Ad Absurdum
14	P	1, 13 Equivalence
15	$\neg P$	8 Repeat
16	$\neg(P \leftrightarrow Q)$	2–15 Reductio Ad Absurdum
17	$(P \leftrightarrow \neg Q) \rightarrow \neg(P \leftrightarrow Q)$	1–16 Conditional derivation

new line new subproof

Congratulations! This proof is correct.

check proof start over