

HW13-1

Proof Checker Proof Rules Credits Help cs240@cumb.edu Signed in

load unfinished proofs: load repository problems: finished repository problems:

Check Your Proof:

Proof: Repository - hw13.1

Construct a proof for the argument: $\neg \forall x(Fx \vee \neg Fx)$

1	$\neg(Fx \vee \neg Fx)$	
2	$\neg Fx$	
3	$Fx \vee \neg Fx$	2, Addition
4	$\neg(Fx \vee \neg Fx)$	1, Repeat
5	Fx	2-4 Reductio Ad Absurdum
6	$Fx \vee \neg Fx$	5, Addition
7	$\neg(Fx \vee \neg Fx)$	1, Repeat
8	$Fx \vee \neg Fx$	1-2 Reductio Ad Absurdum
9	$\forall x(Fx \vee \neg Fx)$	8, Universal derivation

Congratulations! This proof is correct.

Using the checker:

Notation for logic operators

negation: \neg
conjunction: \wedge
disjunction: \vee
conditional: \rightarrow
biconditional: \leftrightarrow
universal quantification: $\forall x$ or $(\forall x)$
existential quantification: $\exists x$ or $(\exists x)$

Rule names (full and abbreviated)

modus ponens $\rightarrow E$
modus tollens MT
modus tollendo ponens DS
double negation DNE
addition $\vee I$
adjunction $\wedge I$
simplification $\wedge E$
bicondition $\leftrightarrow I$
equivalence $\leftrightarrow E$

HW13-2

Proof Checker Proof Rules Credits Help cs240@cumb.edu Signed in

load unfinished proofs: load repository problems: finished repository problems:

Check Your Proof:

Proof: Repository - hw13.2

Construct a proof for the argument: $\forall xFx \wedge \forall xGx \therefore \forall x(Fx \wedge Gx)$

1	$\forall xFx \wedge \forall xGx$	
2	$\forall xFx$	1, Simplification
3	$\forall xGx$	1, Simplification
4	Fa	2, Universal instantiation
5	Ga	3, Universal instantiation
6	$Fa \wedge Ga$	4, 5 Adjunction
7	$\forall x(Fx \wedge Gx)$	6, Universal derivation

Congratulations! This proof is correct.

Using the checker:

Notation for logic operators

negation: \neg
conjunction: \wedge
disjunction: \vee
conditional: \rightarrow
biconditional: \leftrightarrow
universal quantification: $\forall x$ or $(\forall x)$
existential quantification: $\exists x$ or $(\exists x)$

Rule names (full and abbreviated)

modus ponens $\rightarrow E$
modus tollens MT
modus tollendo ponens DS
double negation DNE
addition $\vee I$

HW13-3

Proof Checker Proof Rules Credits Help cs240@cumb.edu Signed in

load unfinished proofs: load repository problems: finished repository problems:

Check Your Proof:

Proof: Repository - hw13.3

Construct a proof for the argument: $Fa \vee Gb \rightarrow Gb \rightarrow b = c, \neg Fa \therefore Gc$

1	$Fa \vee Gb$	
2	$Gb \rightarrow b = c$	
3	$\neg Fa$	
4	Gb	1, 3 Modus Tollendo Ponens
5	$b = c$	2, 4 Modus Ponens
6	Gc	4, 5 Substitution of Identicals

Congratulations! This proof is correct.

Using the checker:

Notation for logic operators

negation: \neg
conjunction: \wedge
disjunction: \vee
conditional: \rightarrow
biconditional: \leftrightarrow
universal quantification: $\forall x$ or $(\forall x)$
existential quantification: $\exists x$ or $(\exists x)$

Rule names (full and abbreviated)

modus ponens $\rightarrow E$
modus tollens MT
modus tollendo ponens DS
double negation DNE
addition $\vee I$

HW13-4

Proof Checker Proof Rules Credits Help cs240@cumb.edu Signed in

load unfinished proofs: load repository problems: finished repository problems:

Check Your Proof:

Proof: Repository - hw13.4

Construct a proof for the argument: $\forall xy(Fxy \rightarrow x = y), Fab \rightarrow Fba \therefore Fab \rightarrow Fba$

1	$\forall xy(Fxy \rightarrow x = y)$	
2	$\forall xy(Fxy \rightarrow x = y)$	1, Universal instantiation
3	$Fab \rightarrow a = b$	2, Universal instantiation
4	Fab	
5	$a = b$	3, 4 Modus Ponens
6	$b = a$	Identity introduction
7	Fba	5, 6 Substitution of Identicals
8	Fba	4, 7 Substitution of Identicals
9	Fba	7, 8 Substitution of Identicals
10	$Fab \rightarrow Fba$	4-9 Conditional derivation

Congratulations! This proof is correct.

Using the checker:

Notation for logic operators

negation: \neg
conjunction: \wedge
disjunction: \vee
conditional: \rightarrow
biconditional: \leftrightarrow
universal quantification: $\forall x$ or $(\forall x)$
existential quantification: $\exists x$ or $(\exists x)$

Rule names (full and abbreviated)

modus ponens $\rightarrow E$
modus tollens MT
modus tollendo ponens DS
double negation DNE
addition $\vee I$
adjunction $\wedge I$
simplification $\wedge E$

HW13-5

HW13-6

Proof Checker
Proof Rules
Credits
Help
csalas@csumb.edu
Signed in

load unfinished proofs:
load repository problems:
finished repository problems:

Check Your Proof:

Proof: Repository - hw13.6

Construct a proof for the argument: $a = b \vee b = c, Fb \therefore Fa \vee Fc$

1	$a = b \vee b = c$	
2	Fb	
3	$\neg(Fa \vee Fc)$	
4	$\neg(a = b)$	
5	$b = c$	1, 4 Modus Tollendo Ponens
6	$b = b$	Identity introduction
7	Fb	2, Repeat
8	Fc	5, 7 Substitution of identicals
9	$Fa \vee Fc$	8, Addition
10	$\neg(Fa \vee Fc)$	3, Repeat
11	$a = b$	4-10, Reductio Ad Absurdum
12	$a = a$	Identity introduction
13	Fb	2, Repeat
14	$b = a$	11, 12 Substitution of identicals
15	Fa	13, 14 Substitution of identicals
16	$Fa \vee Fc$	15, Addition
17	$\neg(Fa \vee Fc)$	3, Repeat
18	$Fa \vee Fc$	3-17 Reductio Ad Absurdum

🎉 Congratulations! This proof is correct.

Using the checker:

Notation for logic operators

negation:	\sim
conjunction:	\wedge
disjunction:	\vee
conditional:	\rightarrow
biconditional:	\leftrightarrow
universal quantification:	$\forall x (Ax)$
existential quantification:	$\exists x (Ex)$

Rule names (full and abbreviated)

modus ponens	$\rightarrow E$
modus tollens	MT
modus tollendo ponens	DS
double negation	DNE
addition	$\vee I$
adjunction	$\wedge I$
simplification	$\wedge E$
bicondition	$\leftrightarrow I$
equivalence	$\leftrightarrow E$
repeat	Rep
conditional derivation	$\rightarrow I$
reductio ad absurdum	RAA
universal instantiation	AE
universal derivation	AI
existential instantiation	EE
existential generalization	EI

HW13-7