

You may use the following basic propositional validities freely in your proofs. They are all easy to verify, and in fact you should do so when you get a chance. Any other formula that has not been proved valid in class, you have to show valid before using it.

Constants	$\neg true \equiv false$
Double negation	$\neg\neg p \equiv p$
\wedge constants	$p \wedge true \equiv p \quad p \wedge false \equiv false$
\wedge idempotence	$p \wedge p \equiv p$
\wedge commutativity	$p \wedge q \equiv q \wedge p$
\wedge associativity	$p \wedge (q \wedge r) \equiv (p \wedge q) \wedge r$
Contradiction	$p \wedge \neg p \equiv false$
\vee constants	$p \vee false \equiv p \quad p \vee true \equiv true$
\vee idempotence	$p \vee p \equiv p$
\vee commutativity	$p \vee q \equiv q \vee p$
\vee associativity	$p \vee (q \vee r) \equiv (p \vee q) \vee r$
Excluded middle	$p \vee \neg p \equiv true$
\wedge negation	$\neg(p \wedge q) \equiv \neg p \vee \neg q$
\vee negation	$\neg(p \vee q) \equiv \neg p \wedge \neg q$
\wedge left distributivity	$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$
\wedge right distributivity	$(p \vee q) \wedge r \equiv (p \wedge r) \vee (q \wedge r)$
\vee left distributivity	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$
\vee right distributivity	$(p \wedge q) \vee r \equiv (p \vee r) \wedge (q \vee r)$
\Rightarrow equivalence	$p \Rightarrow q \equiv (\neg p) \vee q$
Contraposition	$(p \Rightarrow q) \equiv (\neg q \Rightarrow \neg p)$
\wedge implications	$(p \wedge q) \Rightarrow p \quad (p \wedge q) \Rightarrow q$
\vee implications	$p \Rightarrow (p \vee q) \quad q \Rightarrow (p \vee q)$
\Rightarrow reflexivity	$p \Rightarrow p$
\Rightarrow transitivity	$(p \Rightarrow q) \wedge (q \Rightarrow r) \Rightarrow (p \Rightarrow r)$
\equiv equivalence	$(p \equiv q) \equiv (p \Rightarrow q) \wedge (q \Rightarrow p)$
\equiv negation	$(p \equiv q) \equiv (\neg p \equiv \neg q)$
\equiv reflexivity	$p \equiv p$
\equiv symmetry	$(p \equiv q) \equiv (q \equiv p)$
\equiv transitivity	$(p \equiv q) \wedge (q \equiv r) \Rightarrow (p \equiv r)$