

$(\alpha \wedge \beta) \equiv (\beta \wedge \alpha)$    commutativity of  $\wedge$

$(\alpha \vee \beta) \equiv (\beta \vee \alpha)$    commutativity of  $\vee$

$((\alpha \wedge \beta) \wedge \gamma) \equiv (\alpha \wedge (\beta \wedge \gamma))$    associativity of  $\wedge$

$((\alpha \vee \beta) \vee \gamma) \equiv (\alpha \vee (\beta \vee \gamma))$    associativity of  $\vee$

$\neg(\neg\alpha) \equiv \alpha$    double-negation elimination

$(\alpha \Rightarrow \beta) \equiv (\neg\beta \Rightarrow \neg\alpha)$    contraposition

$(\alpha \Rightarrow \beta) \equiv (\neg\alpha \vee \beta)$    implication elimination

$(\alpha \Leftrightarrow \beta) \equiv ((\alpha \Rightarrow \beta) \wedge (\beta \Rightarrow \alpha))$    biconditional elimination

$\neg(\alpha \wedge \beta) \equiv (\neg\alpha \vee \neg\beta)$    de Morgan

$\neg(\alpha \vee \beta) \equiv (\neg\alpha \wedge \neg\beta)$    de Morgan

$(\alpha \wedge (\beta \vee \gamma)) \equiv ((\alpha \wedge \beta) \vee (\alpha \wedge \gamma))$    distributivity of  $\wedge$  over  $\vee$

$(\alpha \vee (\beta \wedge \gamma)) \equiv ((\alpha \vee \beta) \wedge (\alpha \vee \gamma))$    distributivity of  $\vee$  over  $\wedge$