

Chapter 1.

Which of the following are fully parenthesized propositions?
(CS Item: The BNF for fully parenthesized propositions)

$$(a \Rightarrow b)$$

$$a \Rightarrow b$$

$$a \vee b \wedge c$$

$$\neg a$$

$$(a \vee (b \wedge c))$$

$$(a \vee (b \wedge c)) = ((a \vee b) \wedge (a \vee c))$$

$$(a \vee (b \vee c))$$

Evaluate the following propositions in the given state.

$$(a = T, b = F) : (a \Rightarrow b)$$

$$(a = F, b = F) : (a \Rightarrow b)$$

$$(a = T, b = T) : (a \Rightarrow b)$$

$$(a = T, b = F, c = T) : (a \vee (b \wedge c))$$

$$(a = F, b = F, c = T) : (a \vee (b \wedge c))$$

$$(a = T, b = F, c = F) : (a \vee (b \wedge c))$$

Give a truth table for the following propositions
Cheat sheet: Boolean tables for each operation.

$$(a \vee (b \wedge c))$$

$$(a \wedge (b \wedge c))$$

$$(a \wedge (b \vee c))$$

$$(a \vee (b \vee c))$$

Prove Demorgan's laws using truth tables.

Prove the distributive laws using truth tables.

Prove the following using algebra

Cheat sheet: permissible algebraic laws and theorems.

$$(a \wedge b \wedge c) \vee (c \wedge d) = (a \vee c) \wedge (a \vee d) \wedge (b \vee c) \wedge (b \vee d) \wedge (c \vee d)$$

Prove the following using the natural deduction system

Cheat sheet: Inference rules.

From $p \vee q, \neg q$ *infer* p

Infer $p \wedge (p \Rightarrow q) \Rightarrow q$.