Theorem 5.1 (Logical equivalences.) *Given logical variables p, q, and r, the following equivalences hold.*

Commutative laws:	$p \wedge q$	$\equiv$	$q \wedge p$	$p \vee q$	$\equiv$	$q \vee p$
Associative laws:	$(p \wedge q) \wedge r$	$\equiv$	$p \wedge (q \wedge r)$	$(p \vee q) \vee r$	$\equiv$	$p \vee (q \vee r)$
Distributive laws:	$p \wedge (q \vee r)$	$\equiv$	$(p \wedge q) \vee (p \wedge r)$	$p \vee (q \wedge r)$	$\equiv$	$(p \vee q) \wedge (p \vee r)$
Absorption laws:	$p \wedge (p \vee q)$	$\equiv$	p	$p \vee (p \wedge q)$	$\equiv$	p
Idempotent laws:	$p \wedge p$	$\equiv$	p	$p \vee p$	$\equiv$	p
Double negative law:	$\sim\sim p$	$\equiv$	p			
DeMorgan's laws:	$\sim (p \wedge q)$	$\equiv$	$\sim p \vee \sim q$	$\sim (p \vee q)$	$\equiv$	$\sim p \wedge \sim q$
Negation laws:	$p \vee \sim p$	$\equiv$	T	$p \wedge \sim p$	$\equiv$	F
Universal bound laws:	$p \vee T$	$\equiv$	T	$p \wedge F$	$\equiv$	F
Identity laws:	$p \wedge T$	$\equiv$	p	$p \vee F$	$\equiv$	p
Taut/contra laws:	$\sim T$	$\equiv$	F	$\sim F$	$\equiv$	T

Is spinach on sale?	Do I go to the store?	Is it true that if spinach is on sale, I go to the store?
Yes.	Yes.	
Yes.	No.	
No.	Yes.	
No.	No.	

If spinach is not on sale, then I go to the store.

If spinach is not on sale, I do not go to the store.

If spinach is on sale, I do not go to the store.

An even degree is a necessary condition for a polynomial to have no real roots
means
If a polynomial function has no real roots, then it has an even degree.

A positive global minimum is a sufficient condition for a polynomial to have no real roots
means
If a polynomial function has a positive global minimum, then it has no real roots.

Values all of the same sign is a necessary and sufficient condition for a polynomial to have no real roots.
means
A polynomial function has values all of the same sign if and only if the function has no real roots.