Laws of logic

A. Negation, Associativity, Commutativity

Negation:
$\sim(\sim p) = \sim\sim p = p$

Associative:
$(p + q) + r = p + (q + r)$ $(p \wedge q) \wedge r = p \wedge (q \wedge r)$

Commutative:
$p + q = q + p$ $p \wedge q = q \wedge p$

B. De Morgan's laws

$\sim(p + q) = (\sim p) \wedge (\sim q)$ $\sim(\sim p \wedge \sim q) = (p + q)$
$\sim(p \wedge q) = (\sim p) + (\sim q)$ $\sim(\sim p + \sim q) = (p \wedge q)$

C. Identity laws:

$\sim\text{true} = \text{false}$ $\sim\text{false} = \text{true}$

$p + \text{false} = p$ $p + \text{true} = \text{true}$
$p \wedge \text{true} = p$ $p \wedge \text{false} = \text{false}$

D. Inverse Laws:

$p + \sim p = \text{true}$ $p \wedge \sim p = \text{false}$

E. Idempotent Laws:

$p + p = p$ $p \wedge p = p$
$(p \wedge q) + (p \wedge q) = (p \wedge q)$ $(p + q) \wedge (p + q) = (p + q)$

F. Distributive Laws:

$(p \wedge q) + r = (p + r) \wedge (q + r)$ $p + (q \wedge r) = (p+q) \wedge (p+r)$
$(p + q) \wedge r = (p \wedge r) + (q \wedge r)$ $p \wedge (q+r) = (p \wedge q) + (p \wedge r)$

Factoring Form of the Distributive Law:

Left factoring: **Right factoring:**
$(p \wedge q) + (p \wedge r) = p \wedge (q + r)$ $(p \wedge r) + (q \wedge r) = (p + q) \wedge r$
$(p + q) \wedge (p + r) = p + (q \wedge r)$ $(p + r) \wedge (q + r) = (p \wedge q) + r$

G. Absorption Laws:

$p \wedge (p + q) = p$ $p + (p \wedge q) = p$
$(p + q) \wedge p = p$ $(p \wedge q) + p = p$