MAD 2104 Honors Discrete Mathematics

(1) atomic sentence p.19, p.23
(2) predicate p.19, p.32
(3) function symbol p.20, p.31, p.32
(4) arity p.21, p.33
(5) infix v. prefix notation p.23
(6) literal
(7) complex sentence
(8) arguments, premises, and conclusion, p.41
(9) logical consequence p.42
(10) sound argument p.43
(11) indiscernibility of identicals (=substitution) p.49
(12) counterexamples p.63
(13) Boolean connectives (operators) p.67
(14) truth table p. 67
(15) DeMorgan's Laws p.83
(16) TW-possible p.95
(17) Law of Excluded Middle p.97
(18) tautology p.100, p.101
(19) logical necessities p.101
(20) TT-possible p.103
(21) tautological consequence p. 107, p.110, p.111
(22) logical consequence p.107, p.111
(23) Proof by Cases (*vee* Elim) p. 133
(24) Proof by Contradiction aka Indirect Proof (¬Intro) p.137
(25) contradiction p. 138
(26) necessary, sufficient condition p.182
(27) unless p.182, p.183
(28) if and only if, iff p184
(29) just in case p.184
(30) contrapositive p.200
(31) Modus Ponens p.199, p.200
(32) quantified sentences p.229
(33) everything, each thing, all things, anything (∀) - universal quantifier p.232
(34) something, at least one thing, a, an (∃) - existential quantifier p.232
(35) free variable v. bound variable p.234
(36) vacuously p.247
(37) quantifiers and tautologies p. 261
(38) DeMorgan's Laws for quantifiers p.281

A **predicate** takes the appropriate number of subjects and results in an atomic sentence.

A **function symbol** takes the appropriate number of subjects and results in a subject.

A **boolean operator** takes the appropriate number of sentences and results in a sentence.

A **tautology** is a sentence who truth value sin a truth table are all true. (A literal cannot be a tautology.)

A sentence is a **TW-necessity** if it is true in every world where it is defined.

A sentence is **TW-possible** if there is a world where it is true.

A sentence is a **TT-possibility** if there is a row in its truth table that is true.

The sentence Q is a **tautological consequence** of P if when you construct the truth table that includes P and Q, then in any row where P is true, Q is also true. In other words, the sentence P→ Q is a tautology.

The sentence Q is a **logical consequence** of P if for any world where both P and Q are defined, then if P is true in that world, then so is Q. In other words, the sentence P→ Q is a logical necessity.

A **contradiction** is a sentence that is both true and false.