1 The Foundations: Logic and Proofs

1.3 Propositional Equivalences

1. <u>tautology</u> is a compound proposition that is always true

2. <u>contradiction</u> is a compound proposition that is always false

3. <u>contingency</u> is a compound proposition that is neither always false nor always true

4. <u>p and q are logically equivalent $(p \equiv q$)</u> if $p \leftrightarrow q$ is a tautology.

5. $p \equiv q$ is not a compound proposition, but rather the statement that asserts that $p \leftrightarrow q$ is a tautology.

6. $\equiv$ is a symbol that is not a connective like $\lor, \land, \neg$...

7. In proving that two statements are logically equivalent, one can use:

   - truth tables
   - using the logical equivalences already established in Table 6 (one more: $p \rightarrow q \equiv \neg p \lor q$)

8. De Morgan's laws–they help negate compound propositions

9. a compound proposition is <u>satisfiable</u> if that proposition can be true for some assignment of truth values to its components, such an assignment is called a <u>solution</u> (compare this to a tautology where the proposition is true no matter what truth values are assigned to its components).