Implication recap

"P implies Q" or "if P, then Q" has the following truth table:

P	Q	$P \implies Q$
T	T	T
T	F	F
F	T	T
F	F	T

You can rephrase "P implies Q" as "P is a *sufficient condition* for Q" or as "Q is a *necessary condition* for P."

Contrapositive

Logically equivalent to the implication $P \implies Q$ is the implication $(\neg Q) \implies (\neg P)$, called the *contrapositive*.
Example: "If it is Tuesday, then Math 220 meets." The contrapositive statement is, "If Math 220 is not meeting, then it is not Tuesday."

P	Q	$P \implies Q$	$\neg Q$	$\neg P$	$(\neg Q) \implies (\neg P)$
T	T	T	F	F	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

Converse

The *converse* of $P \implies Q$ is the statement $Q \implies P$, not logically equivalent.
"If it is Tuesday, then Math 220 meets" means something different from "If Math 220 meets, then it is Tuesday."

Biconditional

The conjunction of a statement and the converse is the *biconditional* $P \iff Q$, "P if and only if Q," or $(P \implies Q) \wedge (Q \implies P)$.

$P \iff Q$ means "Q is necessary and sufficient for P."

Assignment to hand in next time

Type up a solution to Exercise 17 on page 37 in complete sentences.