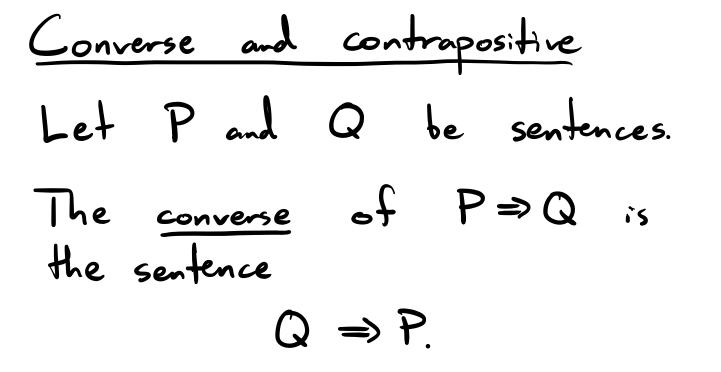
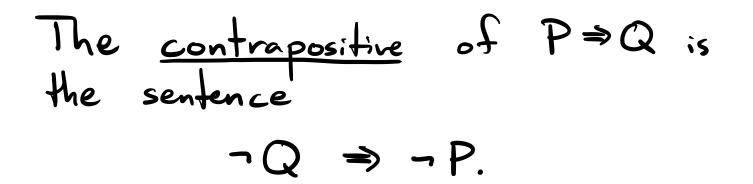
$$\frac{Warm-U_{p}}{Warm-U_{p}}: Use a truth table toshow that $P \Rightarrow Q$ is not
logically equivalent to $Q \Rightarrow P$.$$



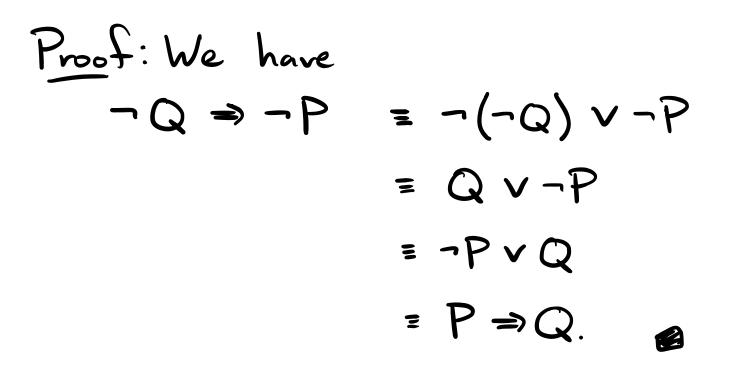


Ex: "If it is raining, then the ground is net."

Converse: "If the ground is net, then it is raining." Contrapositive: "If the ground is dry,

We saw in the Warm-Up that $P \Rightarrow Q$ is not logically equivalent to the converse $Q \Rightarrow P$.

Thm: $P \Rightarrow Q$ is logically equivalent to the contrapositive $-Q \Rightarrow -P$.



Alterntively:

	Ρ	Q	P⇒Q	¬P	¬Q	$\neg Q \Rightarrow \neg P$
•	Т	Т	Т	F	F	au
	Т	F	F	F	Т	F
	F	Т	Т	Т	F	Т
	F	F	Т	Т	Т	T

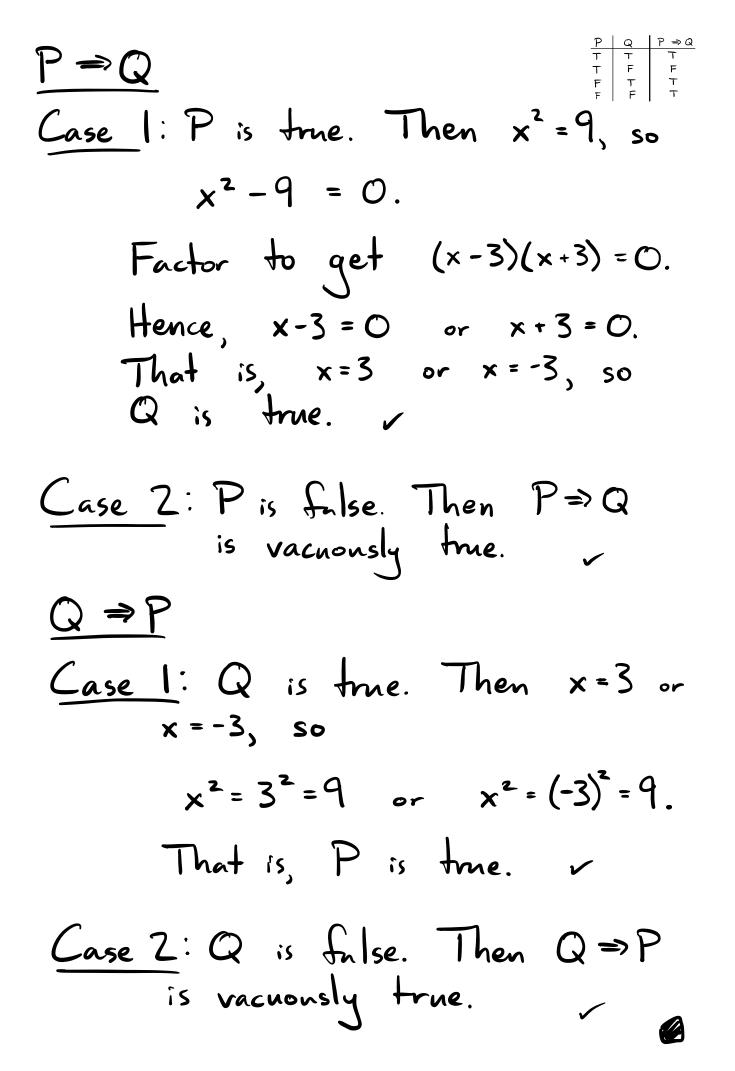
A final logical connective:
(5) Biconditional: (=> means "if and only if"

$$P \rightleftharpoons Q$$
 is true exactly when P and Q have
the same truth value.
 $\frac{P}{T} = \frac{Q}{T} = \frac{P \Leftrightarrow Q}{T}$
 $T = F$
 $F =$

Thm: $P \Leftrightarrow Q$ is logically equivalent to $(P \Rightarrow Q) \land (Q \Rightarrow P)$.

$$E_{\mathbf{x}}: \mathbf{x}^{\mathbf{z}} = 9 \iff \mathbf{x} = 3 \text{ or } \mathbf{x} = -3$$

This sentence is true. Why? Let P be " $x^2 = 9$ " and Q be "x=3 or x=-3." We'll show P \Rightarrow Q and Q \Rightarrow P are both true.



Conditional Proof In general, to show $P \Rightarrow Q$ is true, we must Assume P is true.
 Under this assumption, show that Q must be true also. Why is this valid? When P is false, P=Q is antomatically true. This method is called <u>conditional</u> proof. Most of our theorems will be of the form $P \Rightarrow Q$, so we will write a lot of conditional proofs. To prove a biconditional $P \Leftrightarrow Q$, we need two conditional proofs: for $P \Rightarrow Q$ and $Q \Rightarrow P$.