

## **Propositions**

**Definition.** A *proposition* is a sentence that is either true (T) or false (F), but not both.

**Examples:** Which of the following are propositions?

- The Alamo is located in San Antonio.
- UTSA is the best school in the world.
- It is warm in San Antonio

## Conjunction $\wedge$ **Truth Table: Definition.** Let *p* and *q* be propositions. The $p \wedge q$ q*conjunction* ("and") of *p* and *q*, denoted by Т $p \land q$ , is true when both p and q are true and is false otherwise. Т F Read $p \wedge q$ as: "p and q". **Examples:** Find the conjunction of *p* and *q*: • *p*: "It is sunny today." q: "Today is Monday." » "It is sunny today and today is Monday." The conjunction is true on sunny Mondays (TT) but it is false on any non-sunny day (FT or FF) and it is false on any other day but Monday (TF or FF).

CS 2233 Discrete Mathematical Structures -- Carola Wenk

## Negation

**Definition.** Let *p* be a proposition. The *negation* ("not") of *p*, denoted by  $\neg p$ , has the opposite truth value than the truth value of *p*. Read  $\neg p$  as: "not *p*" or "It is not the case that *p*".

Examples: Negate the following:

- "The Alamo is located in San Antonio."
- » "The Alamo is not located in San Antonio"
- or "It is not the case that the Alamo is located in San Antonio"
- Today is Monday

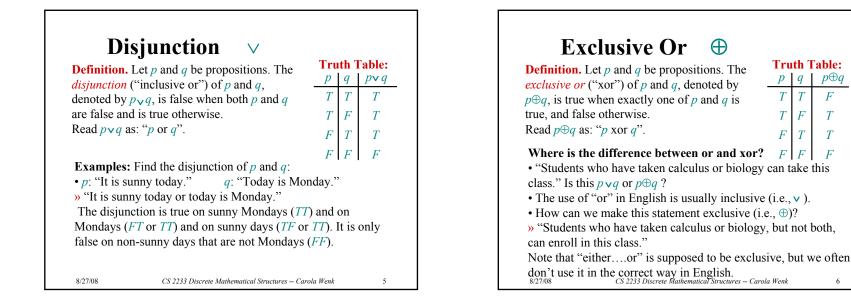
» "Today is not Monday" or "It is not the case that today is Monday"

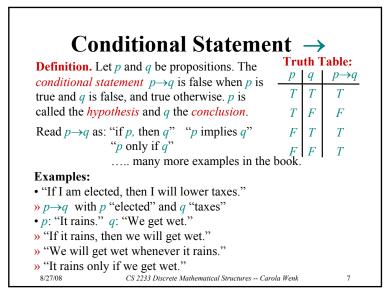
ated in San Anton

3

**Truth Table:** 

2





## Biconditional Statement $\leftrightarrow$

<b>Definition.</b> Let <i>p</i> and <i>q</i> be propositions. The <i>biconditional statement</i> ("iff") $p \rightarrow q$ is true when <i>p</i> and <i>q</i> have the same truth value, and	Truth Table:		
	p	q	$p \leftrightarrow q$
	Т	Т	Т
false otherwise.	Т	F	F
Read $p \leftrightarrow q$ as: " <i>p</i> if and only if <i>q</i> " " <i>p</i> iff <i>q</i> "	F	Τ	F F T
	F	F	Т
<ul><li>Example:</li><li>"You can take the flight if and only if you buy a ticket."</li></ul>			

T

Τ

6

