Discrete Mash Lecture 3

Conditional Statements

aka "if-then" statements
"implications"

notation: $P \Rightarrow Q$ read as: "if P then Q^{c} "P implies Q^{c}

note: one other way to notate this most common P -> Q

Example 3.1. Use the truth table above to determine the truth value of $P \Rightarrow Q$ for each of the given statements.

- (1) $P: 4 \cdot (1/2) = 2, \ Q: 3+5=8$
- (2) $P: \pi^2 < 10, Q: some triangles have only two sides$
- (3) $P: \pi^2 > 10$, Q: some triangles have only two sides
- $(4) P: 3 = 2, Q: 8^2 = 64$

$$P: 4 \cdot (1/2) = 2$$
 is T

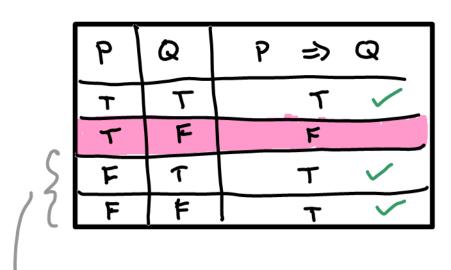
$$(4.(112)=2)=7(3+5=8)$$
 is T
T has. T concl.

Recall the meaning of $P \Rightarrow Q$

a kind of promise

whenever P is T, Q is also T

P=>Q is F when the promise is broken is T otherwise



The promise was brokens

> "vacuoubly true"

It rains => I don't ride my bike.

What happens when its raining I you see me riding my bike?

P => Q is folse!

What happens when its not raining + gour

P=> Q is true (vacuously)

What happens when its not raining
$$+$$
 I don't ride my bike? $P \Rightarrow Q$ is T (vacuously)

$$(e^{\circ}=i) \Rightarrow (\pi > 5)$$
T

and so there's difference between

$$P \Rightarrow Q$$
 and $Q \Rightarrow P$

note pressy much all Marhematical Repuls (Theorems)

are if - then statements

ex! (lin. algebra) If det A = 0, then A is

ex (calculus) If a function is difféable
then it is continuous

final note open sentences

P(x), Q(x)

mado cald

PWA QUA open

P(v) v Q(v) opm

IN & BIN OPEN

P(x) => Q(v) open stamment

the <u>real</u> explanation for how this works involves "quantifiers"

ex P(x): x>0 $Q(x): x^3>0$

P(x) => Q(x)

(x>0) => (x3>0)

"if x>o, then x3>o