

$p$	$q$	$p \wedge q$	$p \vee q$	$\sim p$	$\sim p \vee q$	$p \rightarrow q$
$T$	$T$	$T$	$T$	$F$	$T$	$T$
$T$	$F$	$F$	$T$	$F$	$F$	$F$
$F$	$T$	$F$	$T$	$T$	$T$	$T$
$F$	$F$	$F$	$F$	$T$	$T$	$T$

$p$

$q$

If 12 divides 36 evenly, then 3 divides 72 evenly.

If  $3 < 72$ , then 3 divides 72 evenly.

If 12 divides 36 evenly, then  $72 < 3$ .

If  $72 < 3$ , then 3 divides 72 evenly.

If  $72 < 3$ , then 12 divides 3 evenly.

T	S	R	Q	P
K	L	M	N	O
J	I	H	G	F
E	D	C	B	A

1. Bob passed through *P*.
2. Bob passed through *N*.
3. Bob passed through *M*.
4. If Bob passed through *O*, then Bob passed through *F*.
5. If Bob passed through *K*, then Bob passed through *L*.
6. If Bob passed through *L*, then Bob passed through *K*.

“If Fred was at the dock at midnight, then he’s the murderer.”

“If it’s raining at home and the windows are still open, then water is coming in.”

“If I were John and John were me, then he’d be six and I’d be three.” — A. A. Milne

“If the dryer is finished, then unload it.”

“If you finish your spinach, then I will give you some cake.”

“If it rains tomorrow, the zucchini will sprout.”

An even degree is a **necessary condition** for a polynomial to have no real roots .

*means*

If a polynomial function has no real roots, then it has an even degree.

A positive global minimum is a **sufficient condition** for a polynomial to have no real roots

*means*

If a polynomial function has a positive global minimum, then it has no real roots.

Values all of the same sign is a **necessary** and **sufficient** condition for a polynomial to have no real roots.

*means*

A polynomial function has values all of the same sign if and only if the function has no real roots.

		(original)					
$p$	$q$	conditional	converse	inverse	contrapositive	negation	biconditional
		$p \rightarrow q$	$q \rightarrow p$	$\sim p \rightarrow \sim q$	$\sim q \rightarrow \sim p$	$p \wedge \sim q$	$p \leftrightarrow q$
$T$	$T$	$T$	$T$	$T$	$T$	$F$	$T$
$T$	$F$	$F$	$T$	$T$	$F$	$T$	$F$
$F$	$T$	$T$	$F$	$F$	$T$	$F$	$F$
$F$	$F$	$T$	$T$	$T$	$T$	$F$	$T$