

Test

Wed Jan 31

1.1-1.5, 2.1-2.2

(5 Questions with parts)

Practice Problems on website

Review

Ex: $p =$ "The project was delayed."
 $q =$ "The project manager quit."

Translate to logical notation.

- a) Either the project was not delayed or the project was delayed and the project manager quit.

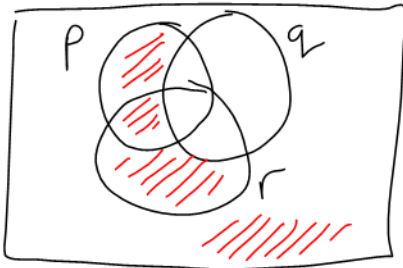
$$\sim p \vee (p \wedge q)$$

- b) The project manager quit and either the project was delayed or it wasn't.

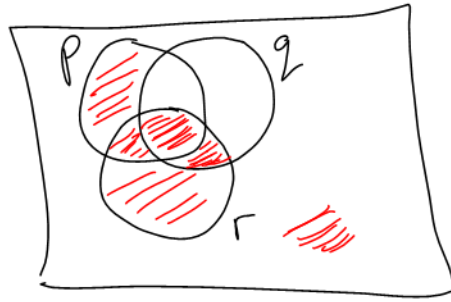
$$q \wedge (p \vee \sim p)$$

ALTERNATIVELY: $q \wedge (p \oplus \sim p)$

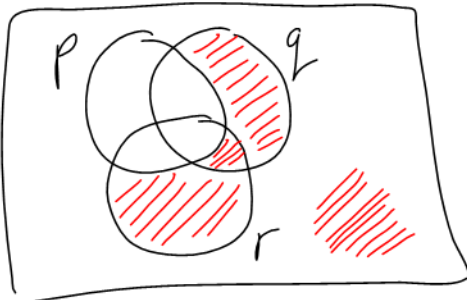
Ex: Draw a Venn diagram for $\sim p \wedge (\sim q \vee r)$



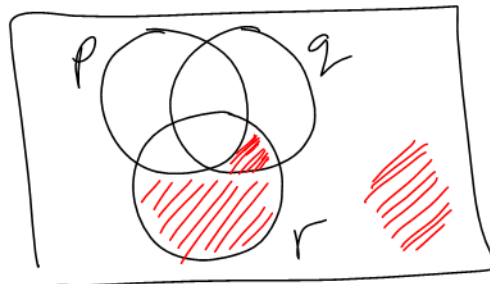
$\sim q$



$\sim q \vee r$

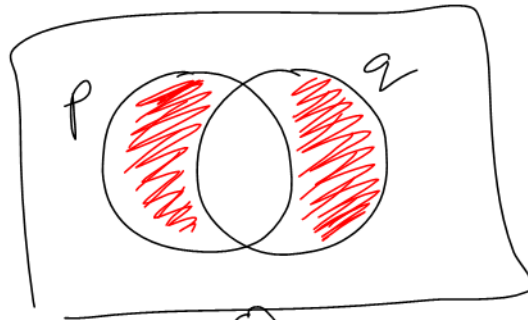


$\sim p$



$\sim p \wedge (\sim q \vee r)$

Aside



$p \oplus q$

2.3 Logical Equivalence

Let $0 = \text{false}$
 $1 = \text{true}$

Ex: Build the truth table for $p \wedge q$

p	q	$p \wedge q$
0	0	0
0	1	0
1	0	0
1	1	1

Interpretation:

2nd row says:

If p is false and q is true then $p \wedge q$ is false.

Quick Ex: Draw the truth table for $\sim p$

p	$\sim p$
0	1
1	0

Ex: Build the truth table for $\sim(p \vee q)$

p	q	$p \vee q$	$\sim(p \vee q)$
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

If we have 3 propositions p, q and r :

p	q	r
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0
1	1	1

Ex: Build the truth table for $\sim(p \vee \sim q) \wedge \sim r$

p	q	r	$\sim q$	$(p \vee \sim q)$	$\sim(p \vee \sim q)$	$\sim r$	$\sim(p \vee \sim q) \wedge \sim r$
0	0	0	1	1	0	1	0
0	0	1	1	1	0	0	0
0	1	0	0	0	1	1	1
0	1	1	0	0	1	0	0
1	0	0	1	1	0	1	0
1	0	1	1	1	0	0	0
1	1	0	0	1	0	1	0
1	1	1	0	1	0	0	0

Two logical expressions are

logically equivalent if they have the same sequence of truth values.

Ex: Is $\sim(p \vee q)$ logically equivalent to $\sim p \wedge \sim q$?

	p	q	$p \vee q$	$\sim(p \vee q)$	$\sim p$	$\sim q$	$\sim p \wedge \sim q$
↓				⋈			⋈
↓				⋈			⋈
↓				⋈			⋈
↓				⋈			⋈

↑ Identical? ↓

Yes