Resolution (3A)

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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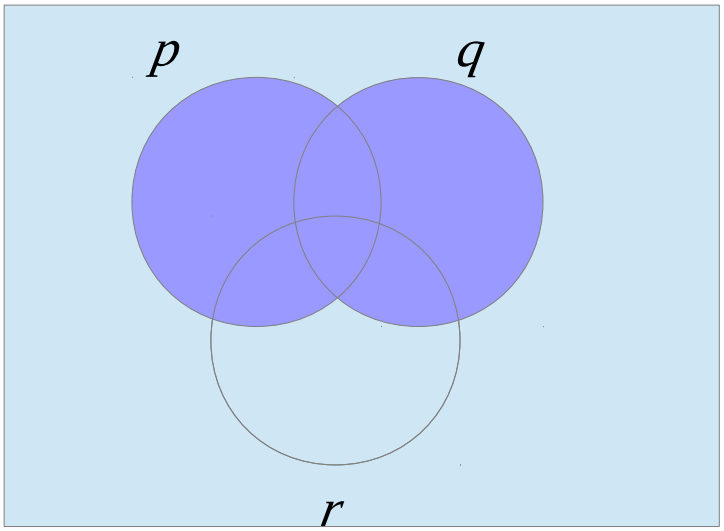
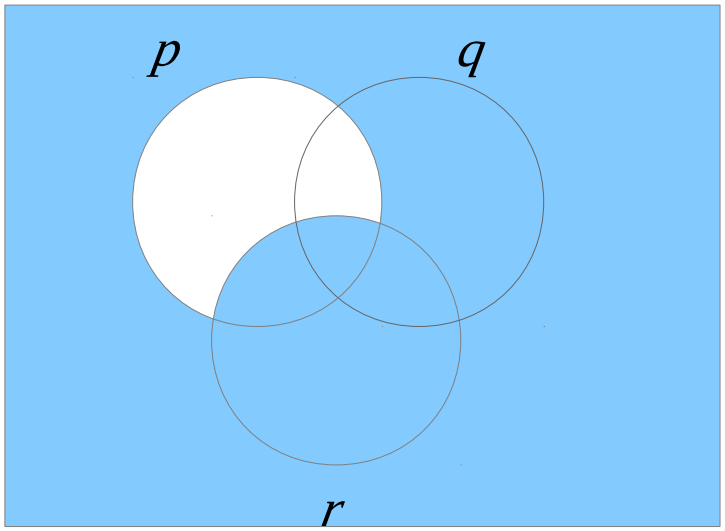
Resolution Example

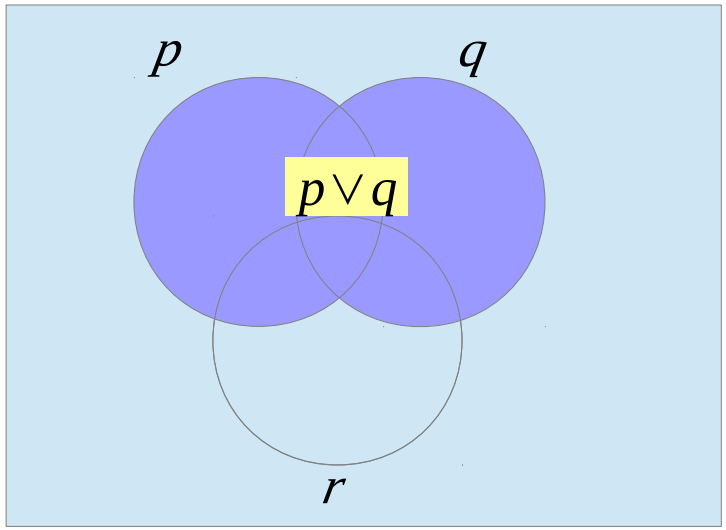
$p \vee q$

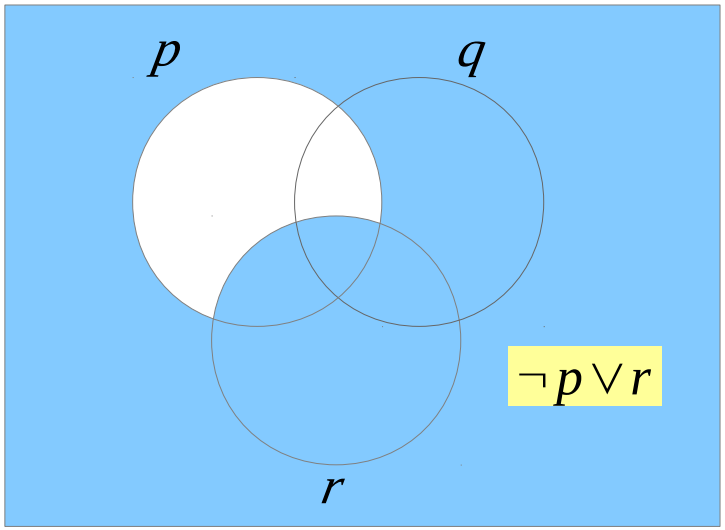


$\neg p \vee r$



When $(p \vee q) \wedge (\neg p \vee r)$ is true

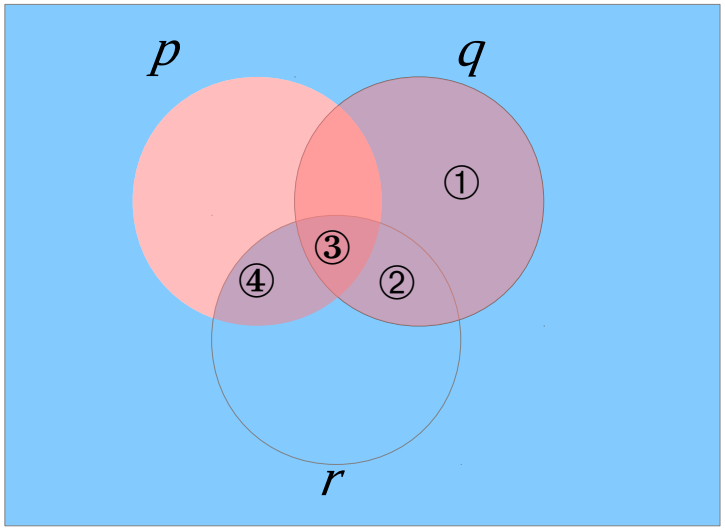




When $p \vee q$ is true
and $\neg p \vee r$ is true

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

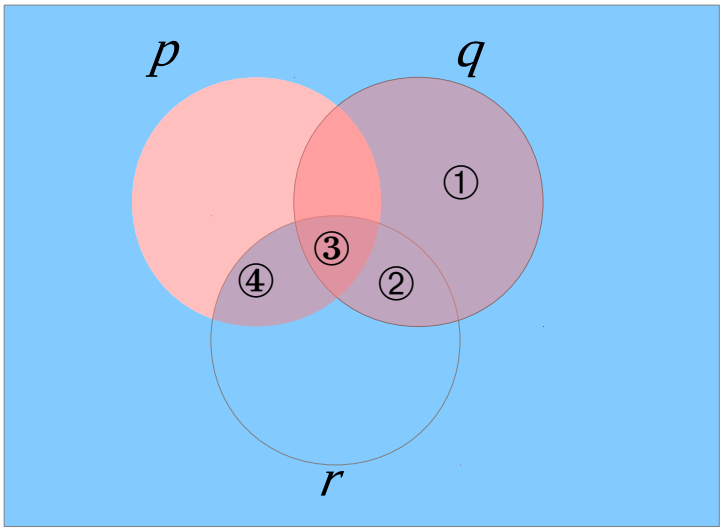
Regions ①+②+③+④



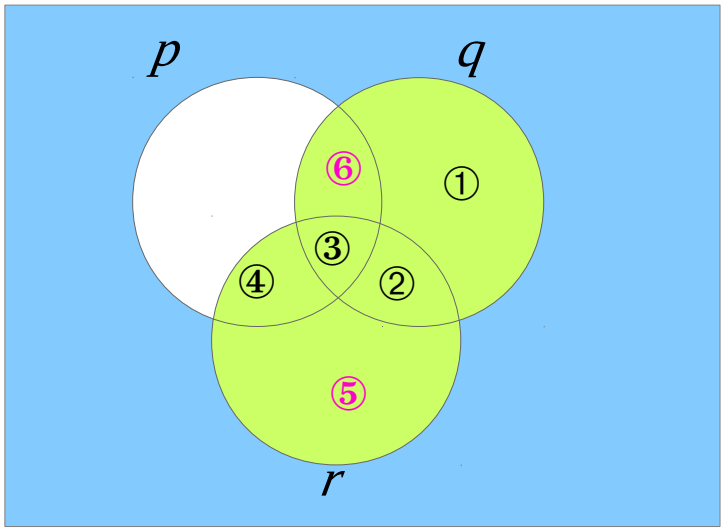
When $(p \vee q) \wedge (\neg p \vee r)$ is true, $q \vee r$ is also true

$p \vee q$

$\neg p \vee r$



$q \vee r$



Regions ①+②+③+④ ⊂ Regions ①+②+③+④+⑤+⑥

$(p \vee q) \wedge (\neg p \vee r) \rightarrow q \vee r$

$(p \vee q) \wedge (\neg p \vee r) \rightarrow q \vee r$

$\neg p$	p	q	r	$p \vee q$	$\neg p \vee r$	$(p \vee q) \wedge (\neg p \vee r)$	$q \vee r$
F	T	T	T	T	T	T →	T
F	T	T	F	T	F	F →	T
F	T	F	T	T	T	T →	T
F	T	F	F	T	F	F →	F
T	F	T	T	T	T	T →	T
T	F	T	F	T	T	T →	T
T	F	F	T	F	T	F →	T
T	F	F	F	F	T	F →	F

Argument

$$\frac{p \vee q \qquad \neg p \vee r}{q \vee r}$$

Case 1: ***p*** is false

$$\frac{F \vee q \qquad T \vee r}{q}$$

when ***p*** is false,
q must be true.

Case 2: ***p*** is true

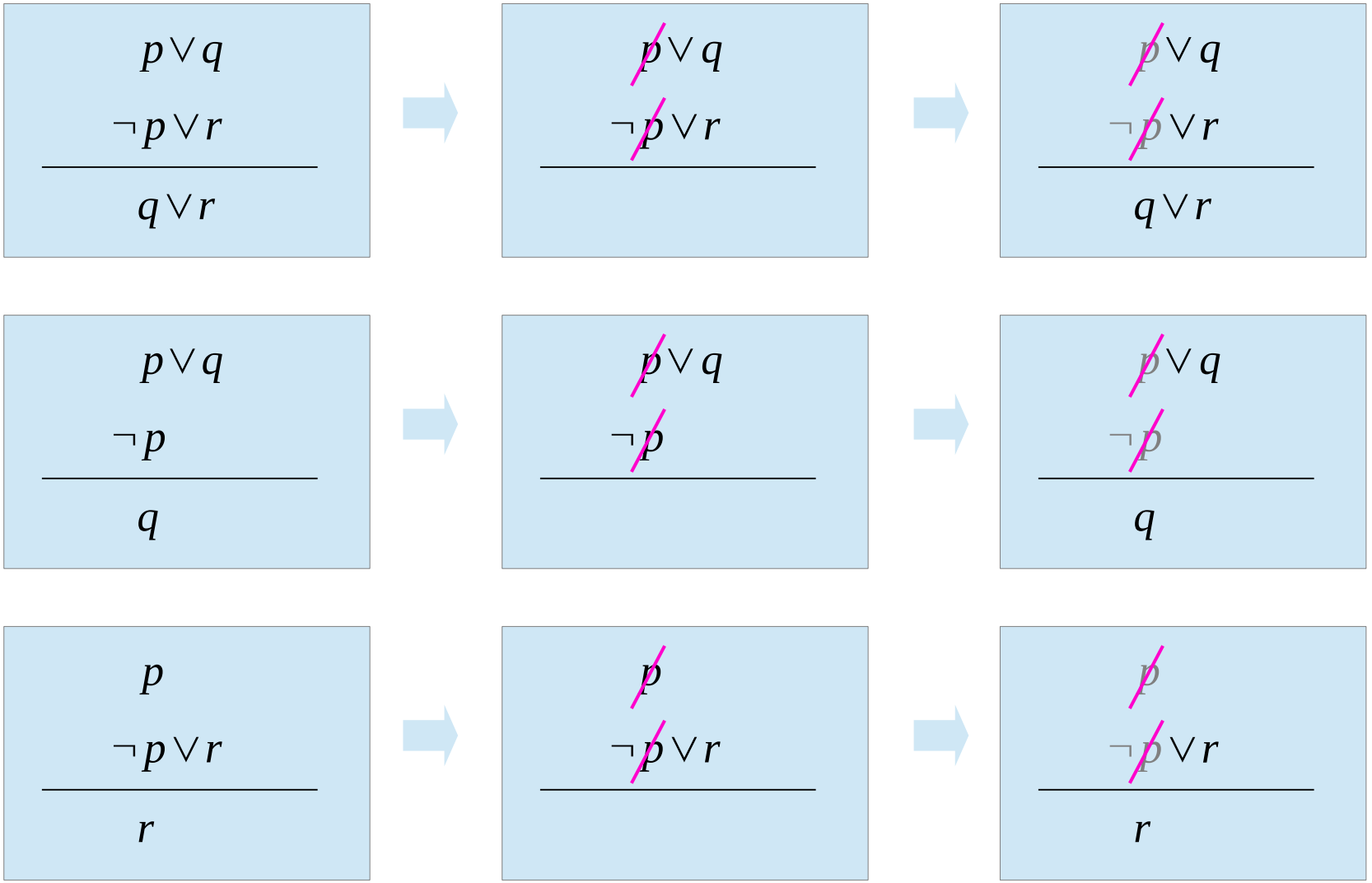
$$\frac{T \vee q \qquad F \vee r}{r}$$

when ***p*** is true,
r must be true.

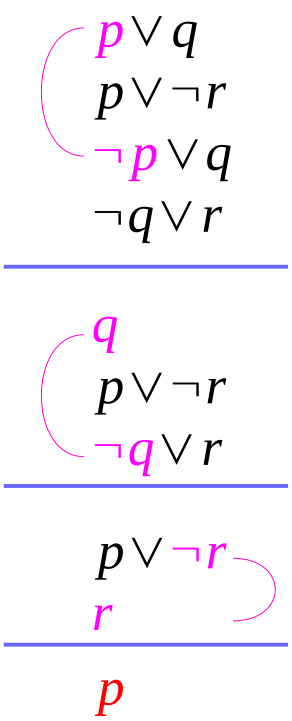
Therefore regardless of truth value of ***p***,
If both premises hold,
then the conclusion $\boldsymbol{q \vee r}$ is true

http://en.wikipedia.org/wiki/Derivative

Resolution Examples



More Example (1)



$$(p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r)$$
$$\vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q)$$
$$\vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q) \wedge (r)$$
$$\vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q) \wedge (r) \wedge (p)$$

James Aspnes, Notes on Discrete Mathematics, CS 202: Fall 2013

More Example (2)

$p \rightarrow q \vee r$
$p \vee \neg q$
$r \vee q$

$\neg p \vee q \vee r$
$p \vee \neg q$
$r \vee q$

$q \vee r$
$\neg q$
$r \vee q$

$r \vee r$

---

r

$\not{q} \vee r$
$\neg \not{q}$
$r \vee \not{q}$

$r \vee r$

---

r

References

[1] http://en.wikipedia.org/
[2]