

Resolution (3A)

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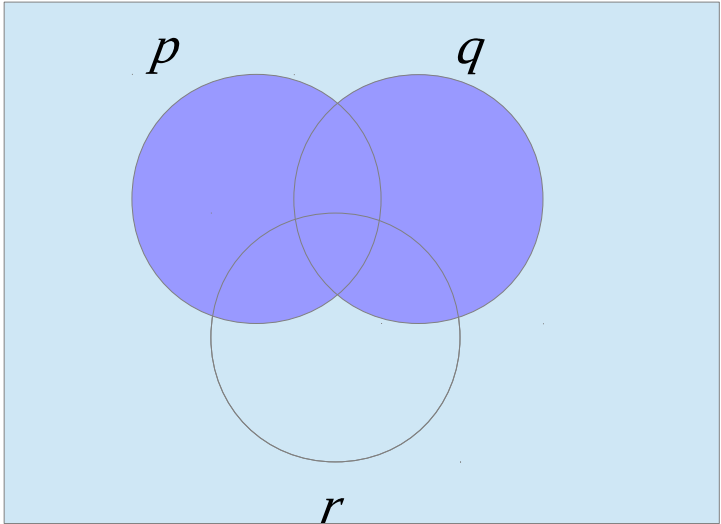
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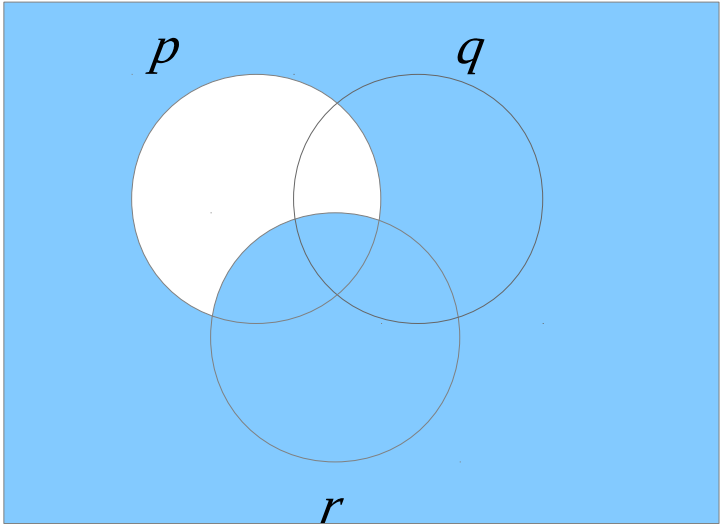
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Resolution Example

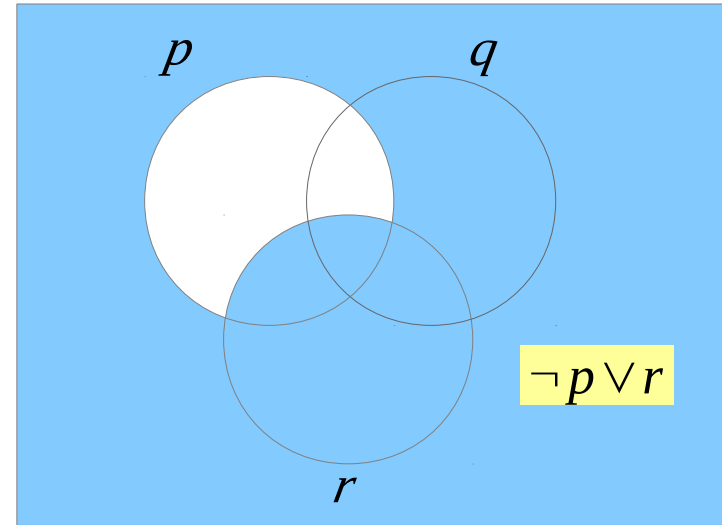
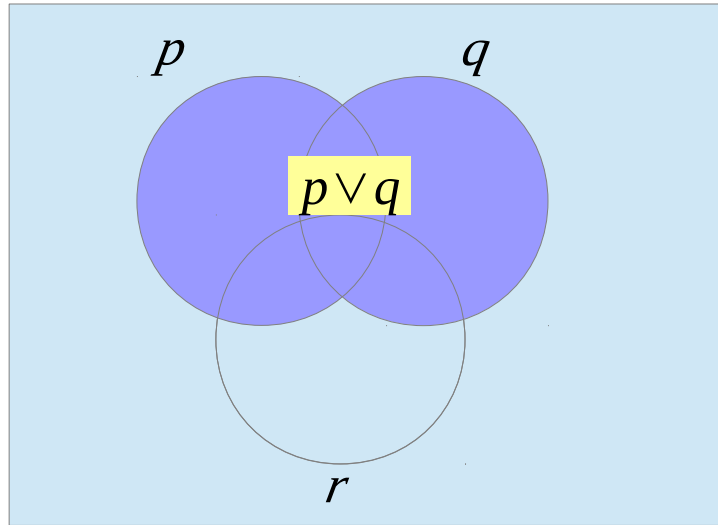
$p \vee q$



$\neg p \vee r$



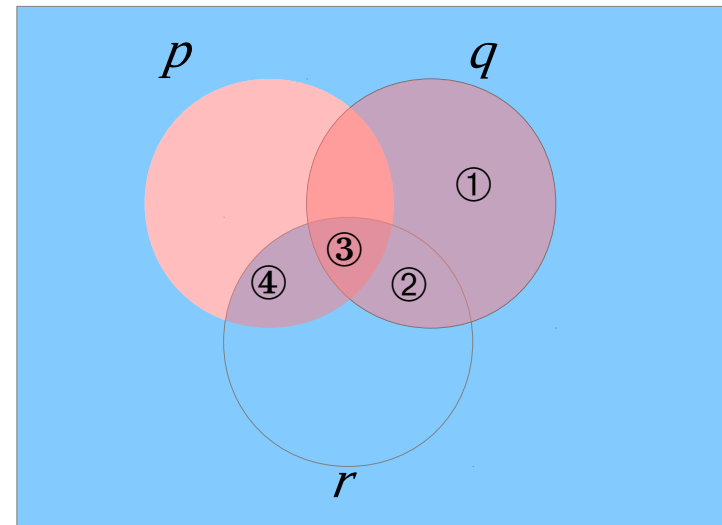
When $(p \vee q) \wedge (\neg p \vee r)$ is true



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

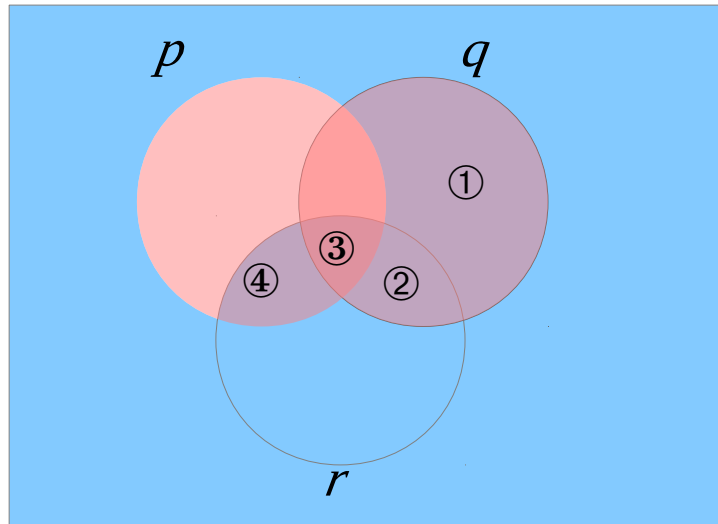
$$(p \vee q) \wedge (\neg p \vee r)$$

Regions ①+②+③+④

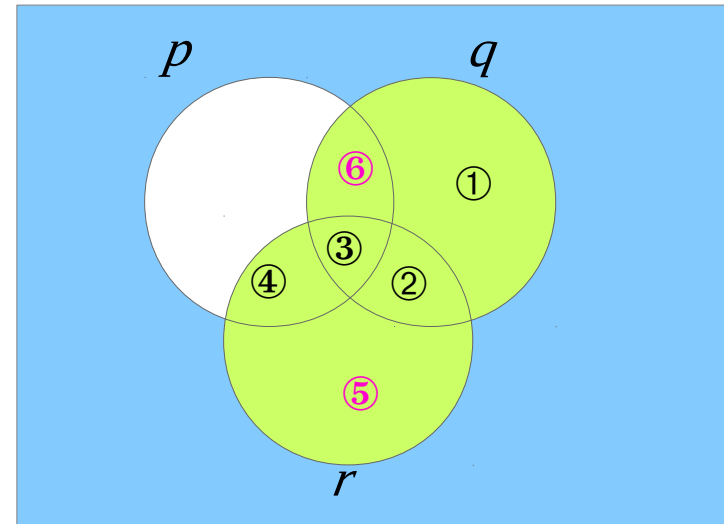


When $(p \vee q) \wedge (\neg p \vee r)$ is true, $q \vee r$ is also true

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



$q \vee r$



Regions ①+②+③+④











Regions ①+②+③+④+⑤+⑥

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



$q \vee r$

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

$\neg p$	p	q	r	$p \vee q$	$\neg p \vee r$	$(p \vee q) \wedge (\neg p \vee r)$	$q \vee r$
<i>F</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i> 	<i>T</i>
<i>F</i>	<i>T</i>	<i>T</i>	<i>F</i>	<i>T</i>	<i>F</i>	<i>F</i> 	<i>T</i>
<i>F</i>	<i>T</i>	<i>F</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i> 	<i>T</i>
<i>F</i>	<i>T</i>	<i>F</i>	<i>F</i>	<i>T</i>	<i>F</i>	<i>F</i> 	<i>F</i>
<i>T</i>	<i>F</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i>	<i>T</i> 	<i>T</i>
<i>T</i>	<i>F</i>	<i>T</i>	<i>F</i>	<i>T</i>	<i>T</i>	<i>T</i> 	<i>T</i>
<i>T</i>	<i>F</i>	<i>F</i>	<i>T</i>	<i>F</i>	<i>T</i>	<i>F</i> 	<i>T</i>
<i>T</i>	<i>F</i>	<i>F</i>	<i>F</i>	<i>F</i>	<i>T</i>	<i>F</i> 	<i>F</i>

Argument

$$\begin{array}{c} p \vee q \\ \neg p \vee r \\ \hline q \vee r \end{array}$$

Case 1: p is false

$$\begin{array}{c} F \vee q \\ T \vee r \\ \hline q \end{array}$$

when p is false,
 q must be true.

Case 2: p is true

$$\begin{array}{c} T \vee q \\ F \vee r \\ \hline r \end{array}$$

when p is true,
 r must be true.

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

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

Resolution Examples

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



$$\frac{\cancel{p \vee q} \quad \neg p \vee r}{q \vee r}$$



$$\frac{\cancel{p \vee q} \quad \cancel{\neg p \vee r}}{q \vee r}$$

$$\frac{p \vee q \quad \neg p}{q}$$



$$\frac{\cancel{p \vee q} \quad \cancel{\neg p}}{q}$$



$$\frac{\cancel{p \vee q} \quad \cancel{\neg p}}{q}$$

$$\frac{p \quad \neg p \vee r}{r}$$



$$\frac{\cancel{p} \quad \neg p \vee r}{r}$$



$$\frac{\cancel{p} \quad \cancel{\neg p \vee r}}{r}$$

More Example (1)

$$\begin{array}{l} \left(\begin{array}{l} p \vee q \\ p \vee \neg r \\ \neg p \vee q \\ \neg q \vee r \end{array} \right) \\ \hline \left(\begin{array}{l} q \\ p \vee \neg r \\ \neg q \vee r \end{array} \right) \\ \hline \begin{array}{l} p \vee \neg r \\ r \end{array} \\ \hline p \end{array}$$

$$\begin{array}{l} (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \\ \vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q) \\ \vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q) \wedge (r) \\ \vdash (p \vee q) \wedge (p \vee \neg r) \wedge (\neg p \vee q) \wedge (\neg q \vee r) \wedge (q) \wedge (r) \wedge (p) \end{array}$$

More Example (2)

$$p \rightarrow q \vee r$$

$$p \vee \neg q$$

$$r \vee q$$

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

$$p \vee \neg q$$

$$r \vee q$$

$$q \vee r$$

$$\neg q$$

$$r \vee q$$

$$r \vee r$$

$$r$$

$$\cancel{q \vee r}$$

$$\cancel{\neg q}$$

$$\cancel{r \vee q}$$

$$r \vee r$$

$$r$$

Discrete Mathematics, Johnsonbough

References

- [1] <http://en.wikipedia.org/>
- [2]