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

not (dance or sing)

She does not dance well and
she does not sing beautifully

$p \Rightarrow q$
If p, then q

(#2) $p \Rightarrow (\neg r \wedge \neg q)$

If the train leaves from gate 2, (p)
then the train leaves today and (¬r)
it doesn't leave from gate 8. (¬q)

(b) $\neg r \Leftrightarrow (p \vee q)$

Memorize

p	q	$p \wedge q$	$p \vee q$	If p, then q: $p \Rightarrow q$	$p \Leftrightarrow q$
T	T	T	T	T	T
T	F	F	T	F	F
F	T	F	T	T	F
F	F	F	F	T	T

Statement: $p \Rightarrow q$

Converse: $q \Rightarrow p$

Inverse: $\neg p \Rightarrow \neg q$

Contrapositive: $\neg q \Rightarrow \neg p$

same truth value

A <u>tautology</u> is true in all cases.

A <u>contradiction</u> is false in all cases

An <u>invalid argument</u> is <u>not</u> always true.