

Section 9.3

① a) if r then s



Note: The conclusion is always the outer circle.
The conclusion is s .

b) r implies s



The conclusion is s .

c) r is necessary for s .



The conclusion is r .

① d) r is sufficient for s



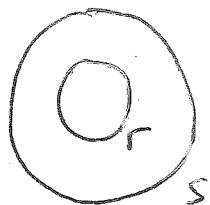
The conclusion is s .

e) r if s



The conclusion is r .

f) r only if s



The conclusion is s .

②

p	q	$p \oplus q$	$(p \oplus q) \rightarrow q$
T	T	F	T
T	F	T	F
F	T	T	T
F	F	F	T

③

p	q	$p \wedge q$	$p \oplus q$	$(p \wedge q) \leftrightarrow (p \oplus q)$
T	T	T	F	F
T	F	F	T	F
F	T	F	T	F
F	F	F	F	T

④

p	q	r	$p \rightarrow q$	$(p \rightarrow q) \rightarrow r$
T	T	T	T	T
T	T	F	T	F
T	F	T	F	T
T	F	F	F	T
F	T	T	T	T
F	T	F	T	F
F	F	T	T	T
F	F	F	T	F

⑤

p	q	r	$\sim q$	$p \vee \sim q$	$\sim r$	$\sim r \rightarrow (p \vee \sim q)$
T	T	T	F	T	F	T
T	T	F	F	T	T	T
T	F	T	T	T	F	T
T	F	F	T	T	T	T
F	T	T	F	F	F	T
F	T	F	F	F	T	F
F	F	T	T	T	F	T
F	F	F	T	T	T	T

⑥

p	q	$\sim p$	$\sim p \vee q$	$p \rightarrow q$	$(\sim p \vee q) \leftrightarrow (p \rightarrow q)$
T	T	F	T	T	T
T	F	F	F	F	T
F	T	T	T	T	T
F	F	T	T	T	T