

# Disc Math - H16 - Clex 1 solutions

①

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

This is a contradiction, since the truth value is False for any truth value assignment to the variables.

- ②
- $(p \vee q) \wedge \sim r$
  - $\sim p \wedge \sim q \wedge r$
  - $\sim(p \vee q \vee \sim r) = \sim p \wedge \sim q \wedge r$

③

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

Not logically equivalent.

④ Contrapositive: If the program does not cycle into an infinite loop then the variable is declared.

Inverse: If the variable is declared then the program will not cycle into infinite loop.

Converse: If the program cycles into an infinite loop then the variable is undeclared.

Negation: The variable is undeclared but the program does not cycle into infinite loop.