

Title: Math 017 Quiz #1, Range 6.1-6.3

Name: _____

Section: _____

1. Find the truth value of $p \vee (q \wedge \sim r)$ if

(a) p and r are true, and q is false. (2pts)

(b) p, q and r are all false. (2pts)

Solution:

(a)

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

$$T \vee (F \wedge F)$$

$$T \vee F$$

$$T$$

So the answer is TRUE.

(b)

$$F \vee (F \wedge \sim F)$$

$$F \vee (F \wedge T)$$

$$F \vee F$$

$$F$$

So the answer is FALSE.

2. (a) Construct the truth table of the statement $(\sim p) \rightarrow (p \vee \sim q)$. (4pts)
 (b) What is the negation of the above statement? Try to simplify your answer. (2pts)
 (Hint: write the conditional as an “OR” statement.)

Solution:

(a)

p	q	$(\sim p)$		\rightarrow	$(p \vee \sim q)$			
T	T	F	T	T	T	T	F	T
T	F	F	T	T	T	T	T	F
F	T	T	F	F	F	F	F	T
F	F	T	F	T	F	T	T	F
Step	No.	2	1	5	1	4	3	1

- (b) First we write the conditional as an “or” statement:

$$\begin{aligned}
 (\sim p) \rightarrow (p \vee \sim q) &\equiv \sim(\sim p) \vee (p \vee \sim q) \\
 &\equiv p \vee (p \vee \sim q).
 \end{aligned}$$

Then the negation of this statement is as follows

$$\begin{aligned}
 \sim [p \vee (p \vee \sim q)] &\equiv \sim p \wedge \sim (p \vee \sim q) && \text{De Morgan's Law} \\
 &\equiv \sim p \wedge \sim p \wedge \sim(\sim q) && \text{De Morgan's Law} \\
 &\equiv \sim p \wedge \sim p \wedge q && \text{Double Negative} \\
 &\equiv (\sim p \wedge \sim p) \wedge q && \text{Associative Law} \\
 &\equiv \sim p \wedge q && \text{Idempotent Law}
 \end{aligned}$$

Therefore the negation of $(\sim p) \rightarrow (p \vee \sim q)$ is $\sim p \wedge q$.