(B in Green)

Name: _____ Quiz 1-A

Math 301 Discrete Mathematics – Crawford 20 February 2019

Books, calculators, and notes (in any form) are not are allowed. Show all your work for credit. ***Good luck!***

1. (6 pts) Use a truth table to determine whether the following argument form is valid. Indicate which columns represent the premises and which represent the conclusion, and include a sentence explaining how the truth table supports your answer.

$p \to q \vee r$
$\sim q \vee \sim r$
$\therefore \quad \sim p \vee \sim r$

This is an invalid argument since the truth table shows a case where the premises are all true, but the conclusion is false.

Premises Conclusion

p	q	r	$\sim p$	$\sim q$	$\sim r$	$q \vee r$	$p \to q \vee r$	$\sim q \vee \sim r$	$\sim p \vee \sim r$
T	T	T	F	F	F	T	T	F	F
T	T	F	F	F	T	T	T	T	T
T	F	T	F	T	F	T	T	T	F
T	F	F	F	T	T	F	F	T	T
F	T	T	T	F	F	T	T	F	T
F	T	F	T	F	T	T	T	T	T
F	F	T	T	T	F	T	T	T	T
F	F	F	T	T	T	F	T	T	T

2. (3 pts) Given the following argument,

If Jack aced his interview, then Jack will attend Harvard Law School. (p → q)
Jack will attend Harvard Law School.
∴ Jack aced his interview.

(a). Use symbols to write the logical form of the argument.

$p \to q$
q
$\therefore p$

(b). State whether the converse error, inverse error, or neither is made in the argument.

Converse Error

3. (1 pts) Which of the following argument forms represents GENERALIZATION? [Circle One.]

$p \vee q$
$\sim p$
$\therefore \quad q$

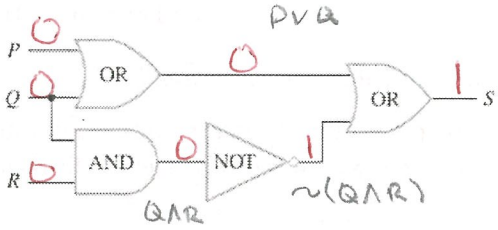
q
$\therefore \quad p \vee q$

p
q
$\therefore \quad p \wedge q$

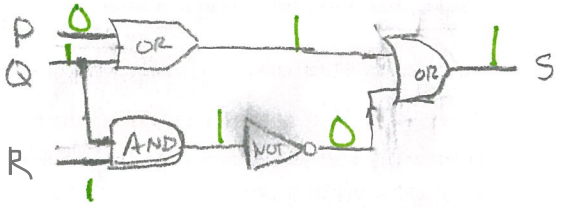
Version B: Different order

A-

4. (4 pts) Given the circuit below.



(P∨Q)∨~(Q∧R)



(a). Determine the output signal S if the input signals are $P = 0, Q = 0$, and $R = 0$. [Show the input, intermediate, and output signals on the diagram above.] S = 1 See above.

Version B: P = 0, Q = 1, R = 1

(b). Find the Boolean expression that corresponds to the circuit.

$(P \vee Q) \vee \sim(Q \wedge R)$

5. (2 pts) Given the following statement: $\exists x \in \mathbb{Z}$ such that $x^3 = -8$.

Which of the following statements are equivalent ways of expressing the original statement. No justification necessary.

(a). If x is an integer, then $x^3 = -8$. No

(b). Some integers have a cube of -8. Yes

(c). Some integer has a cube of -8. Yes

(d). The number x has a cube of -8, for at least one integer x. Yes

Version B: Different Order.

6. (4 pts) Determine whether the following statements are TRUE or FALSE. If it is FALSE, give a COUNTEREXAMPLE.

(a). Every integer is a real number. TRUE

(b). $\forall$ real numbers x and y, $\sqrt{x+y} = \sqrt{x} + \sqrt{y}$.

FALSE Counterexample: Let $x = 9, y = 16 \in \mathbb{R}$

But $\sqrt{x+y} = \sqrt{9+16} = \sqrt{25} = 5$

$\sqrt{x}+\sqrt{y} = \sqrt{9}+\sqrt{16} = 3+4 = 7$

NOT EQUAL