Universidad de Puerto Rico
Departamento de Matemáticas
MATE 3018 – Repaso 1–

Apellidos: _____ _____ Nombre _____
No. Estudiante: _____ Profesor: _____ Sección _____

(1) Let p and q be two open sentences defined on $\mathbb{R}$ whose solution sets are given by $CS_p := \{x \in \mathbb{R} : x \leq 5\}$ and $CS_q := \{x \in \mathbb{R} : \ 0 \leq x \leq 15\}$. Find and graph each of the following solution set:

(a) $CS_{p \wedge q}$:

(b) $CS_{p \vee q}$:

(c) $CS_{(p \wedge q)'}$:

(d) $CS_{(p \vee q)'}$:

(2) Use the following truth table to prove that $p' \wedge q' = (p \vee q)'$ and $p' \vee q' = (p \wedge q)'$.

p	q	p'	q'	$p' \wedge q'$	$p \vee q$	$(p \vee q)'$
T	T					
T	F					
F	T					
T	F					

p	q	p'	q'	$p' \vee q'$	$p \wedge q$	$(p \wedge q)'$
T	T					
T	F					
F	T					
T	F					

(3) Use the following truth table to prove that $p \to q = (p \vee q')'$.

p	q	p'	$p \vee q'$	$(p \vee q')'$	p→ q	$p \to q = (p \vee q')'$
T	T					
T	F					
F	T					
F	T					

(4) What is the relation between $(p \wedge q')$ and $p \to q$?

(5) Consider the sentence: **The integer n in even only if n^2 is an even integer**.

(a) State the sentence in the "if.. then" form.

(b) State the converse of the sentence.

(c) State the contraposition of the sentence.

(6) Let A and B be sets and consider the sentences **p:** $A \subset B$ **and** $q: \ A \cup B = B$.

(a) State $p \to q$ and indicate if it is true or false.

(b) State the contraposition of $p \to q$ and indicate if it is true or false.

(c) State the converse of $p \to q$ and indicate if it is true or false.

(7) State the negation of each of the following sentences:

(a) $3x = 8$ or $x > 10$.

(b) $5x \geq 3$ of $2x < 8$.

(c) All divisors of 10 are prime.

(d) There exists a real number x such that $x^2 < 0$.

(e) There is a positive square root of 2.

(f) There is a square whose sides have length 2.

(8) Consider the open sentences $p:\ 3x+2 \leq -7$, $q:\ 5-4x \leq -11$, $r:\ 4x+3 \leq -1$ and $s:\ -6x \geq -6$. Find and graph the solution set of each of the following open sentences:

(a) $CS_p =$

(b) $CS_q =$

(c) $CS_r =$

(d) $CS_s =$

(e) $CS_{p'} =$

(f) $CS_{q'} =$

(g) $CS_{r'} =$

(h) $CS_{s'} =$

(i) $CS_{r \vee p \vee s} =$

(j) $CS_{q' \vee s' \vee r'} =$

(k) $CS_{r \wedge s) \vee p'} =$

(l) $CS_{p \wedge q \wedge s} =$