Name Solution Key

CMSC203 - Homework Assignment 1 - Due Monday, February 28

1. Let A = { –3, –2, –1, 0, 1, 2, 3} and B = {–4, –2, 0, 2, 4} be subsets of the Universal Set U = {–5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5}. Verify by calculation that: $(A \cup B^c)^c = A^c \cap B$.

$B^c = U - B = \{–5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5\} - \{–4, –2, 0, 2, 4\} = \{–5, –3, –1, 1, 3, 5\}$, so

$A \cup B^c = \{ –3, –2, –1, 0, 1, 2, 3\} \cup \{–5, –3, –1, 1, 3, 5\} = \{–5, –3, –2, –1, 0, 1, 2, 3, 5\}$, thus

$(A \cup B^c)^c = U - (A \cup B^c) = \{–5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5\} – \{–5, –3, –2, –1, 0, 1, 2, 3, 5\}$
$= \{–4, 4\}$.

$A^c = U - A = \{–5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5\} – \{–3, –2, –1, 0, 1, 2, 3\} = \{–5, –4, 4, 5\}$,

hence $A^c \cap B = \{–5, –4, 4, 5\} \cap \{–4, –2, 0, 2, 4\} = \{–4, 4\}$.

Therefore, $(A \cup B^c)^c = \{–4, 4\} = A^c \cap B$.

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2. If A = { {1} , ∅ }, find the Power Set of A.

P(A) = { ∅, { {1} }, { ∅ }, { {1}, ∅ } }

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3. Find the truth table of the statement $[p \vee (q \wedge \sim r)] \rightarrow \sim q$.

p	q	r	[p	$\vee$	(q	$\wedge$	$\sim r$)]	$\rightarrow$	$\sim q$
T	T	T	T	T	T	F	F	***F***	F
T	T	F	T	T	T	T	T	***F***	F
T	F	T	T	T	F	F	F	***T***	T
T	F	F	T	T	F	F	T	***T***	T
F	T	T	F	F	T	F	F	***T***	F
F	T	F	F	T	T	T	T	***F***	F
F	F	T	F	F	F	F	F	***T***	T
F	F	F	F	F	F	F	T	***T***	T
Step			*1*	*3*	*1*	*2*	*1*	*4*	*1*

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4. For the given set of premises, show the following is a valid argument.

$\sim r \wedge s$
$q \rightarrow r$
$p \wedge s \rightarrow t$
$p \vee q$

$\therefore t$

Step1:
$\sim r \wedge s$

$\therefore \sim r$
$\therefore s$

Step 2:
$q \rightarrow r$
$\sim r$

$\therefore \sim q$

Step 3:
$p \vee q$
$\sim q$

$\therefore p$

Step 4:
p
s

$\therefore p \wedge s$

Step 5:
$p \wedge s \rightarrow t$
$p \wedge s$

$\therefore t$

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5. Use the Property of Sets to show that $A - (A - B) = A \cap B$.

$A - (A - B)$
$= A \cap (A - B)^c$
$= A \cap (A \cap B^c)^c$
$= A \cap [A^c \cup (B^c)^c]$
$= A \cap (A^c \cup B)$
$= (A \cap A^c) \cup (A \cap B)$
$= \varnothing \cup (A \cap B)$
$= A \cap B.$

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6. Give the converse, inverse, contrapositive and negation of the statement:
All people who live in glass houses do not throw stones.

Converse

All people who do not throw stones live in glass houses.

Inverse

All people who do not live in glass houses throw stones.

Contrapositive

All people who throw stones do not live in glass houses.

Negation

Some people live in glass houses and throw stones.