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Homework 2

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Problem 1

Finding the nature of the inhabitant of the island.

A: Aramis is a Knight B: Berthand is a Knight C: Charleston is a Knight
They say:
Aramis: $\neg$ B
Berthand: $\neg$ C $\oplus$ B
Charleston: A $\wedge$ $\neg$ B
lets D:$\neg$ B $\Leftrightarrow$ $\neg$ C $\oplus$ B
E: $\neg$ B $\Leftrightarrow$ A $\wedge$ $\neg$ B
G: $\neg$ C $\oplus$ B $\Leftrightarrow$ A $\wedge$ $\neg$ B

A	B	C	$\neg$ B	$\neg$ C	$\neg$ C $\oplus$ B	A $\wedge$ $\neg$ B	D	E	G	D$\wedge$E$\wedge$G
T	T	T	F	F	T	F	F	T	F	F
T	F	F	T	T	T	T	T	T	T	T
T	T	F	F	T	F	F	T	T	T	T
T	F	T	T	F	F	T	F	T	F	F
F	T	T	F	F	T	F	F	T	F	F
F	F	F	T	T	T	F	T	F	F	F
F	T	F	F	T	F	F	T	T	T	T
F	F	T	T	F	F	F	F	F	T	F

Bertrand is a Night, Charleston is Knave and Aramis is a Knave

Problem 2

1. Using the truth table to demonstrate that ((p$\rightarrow$q)$\wedge$(q$\rightarrow$r)$\rightarrow$ (p$\rightarrow$r) is a tautology

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

The statement is a tautology.

2. Using chain of logical equivalent.
((p$\rightarrow$q)$\wedge$(q$\rightarrow$r))$\rightarrow$ (p$\rightarrow$r) $\equiv$ $\neg$(($\neg$p$\vee$q)$\wedge$($\neg$q$\vee$r))$\vee$ ($\neg$p$\vee$r)
$\equiv$$\neg$(($\neg$p$\vee$q)$\wedge$($\neg$q$\vee$r))$\vee$ ($\neg$p$\vee$r)

$\equiv((p\wedge\neg q)\wedge(q\wedge\neg r))\vee(\neg p\vee r)$
$\equiv((q\wedge\neg q)\wedge(p\wedge\neg r))\vee(\neg p\vee r)$
$\equiv((p\wedge\neg r))\vee(\neg p\vee r)$

3. Showing that (p→q) → r and p→(q → r) are not logical equivalent.

p	q	r	p→q	q→r	(p→q) → r	p→(q → r)
T	T	T	T	T	T	T
T	F	F	F	T	T	T
T	T	F	T	F	T	F
T	F	T	F	T	F	T
F	T	T	T	T	T	T
F	F	F	T	T	T	T
F	T	F	T	F	T	T
F	F	T	T	T	T	T

The last two columns contain contradictory statements, thus the two logical statements are not equivalent.

Problem 3

1. $\forall xp(x) \equiv P(5)\wedge P(6)\wedge P(7)\wedge P(8)$
2. $\neg\exists xp(x) \equiv\neg P(5)\vee\neg P(6)\vee\neg P(7)\vee\neg P(8)$
3. $\neg\forall xp(x)\equiv\neg P(5)\wedge\neg P(6)\wedge\neg P(7)\wedge\neg P(8)$

Problem 4

163	1	
54	0	
18	0	163 in base 3 is $(20001)_3$
6	0	
2	2	

Problem 5

1. Translating each of the group's travel requirements from English into a proposition.
   (a) Shaggy: V ∨ ¬ S;
   (b) Velma: P → ¬ V

   (c) Daphne: B $\leftrightarrow$ (L $\wedge$ P)
   (d) Fred: $\neg$ P
   (e) Scooby: $\exists x T(x) \equiv$ P $\vee$ V $\vee$ S $\vee$ B

2. Satisfaction of the gangs proposition. Lets Sat be the logical the gangs go on vacation. For Sat to be True: (V $\vee$ $\neg$ S) $\wedge$ (P $\rightarrow$ $\neg$ V) $\wedge$ (B $\leftrightarrow$ (L $\wedge$ P)) $\wedge$ ($\neg$ P) $\wedge$ (P $\vee$ V $\vee$ S $\vee$ B) must be true.

3. The team travel whish is possible. If V is true proposition a) will be true no matter the values of S. For b) to be true, P must be false. The statement c) is true only if B is false no matter the outcome of L. Because P was false, the statement d) must be true.Finally as one of the valuein each is true, statement e) is true.
   -Venice
   -Shanghai

4. Park W in west Africa.