MAT 108 HW 1

Hardy Jones
999397426
Professor Bandyopadhyay
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Problem 1

1. This sentence is a proposition. Since 18 is not a multiple of 12, this proposition is false.
2. This sentence is a proposition. Since 3 is prime, this proposition is false.
3. This sentence is not a proposition.
4. This sentence is a proposition. Since $-\frac{1}{2}$ is rational and 3π is less than 10, this proposition is true.
5. This sentence is not a proposition.

Problem 2

1. Since B is a contradiction, this propositional phrase is always false. So this phrase is a contradiction.
2. Since B is a contradiction, the inner phrase is always false, and the negation of that will always be true. So this phrase is a tautology.
3. Since A is a tautology, this propositional phrase is always true. So this phrase is a tautology.

Problem 3

1.

P	Q	R	$Q \vee R$	$P \wedge (Q \vee R)$	$P \wedge Q$	$P \wedge R$	$(P \wedge Q) \vee (P \wedge R)$
T	T	T	T	T	T	T	T
T	T	F	T	T	T	F	T
T	F	T	T	T	F	T	T
T	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F
F	T	F	T	F	F	F	F
F	F	T	T	F	F	F	F
F	F	F	F	F	F	F	F

Since the two shaded columns have the same values at all respective locations, the two propositional phrases are equivalent.

2.

P	Q	R	$P \wedge Q$	$(P \wedge Q) \vee R$	$Q \wedge R$	$P \vee (Q \wedge R)$
T	T	T	T	T	T	T
T	T	F	T	T	F	T
T	F	T	F	T	F	T
T	F	F	F	F	F	T
F	T	T	F	T	T	T
F	T	F	F	F	F	F
F	F	T	F	T	F	F
F	F	F	F	F	F	F

Since the two shaded columns do not have the same values at all respective locations, the two propositional phrases are not equivalent.