

Problem set 1

Problem 1:

a.

P	Q	$((\neg P \wedge (P \vee Q)) \rightarrow (r \wedge Q))$	$P \vee Q$
T	T	T	T
T	T	T	T
T	F	T	T
T	F	T	T
F	T	T	T
F	T	F	T
F	F	T	F
F	F	T	F

* Not equivalent; Counter example shown by highlighted

b.

P	Q	$((P \rightarrow Q) \wedge (Q \rightarrow P))$	$(P \vee (\neg P \vee Q)) \vee \neg Q$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	T	T

* Not equivalent; Counter examples highlighted

c.

P	Q	R	t	$\neg(P \vee \neg(Q \vee \neg(r \vee t)))$	$(\neg P \vee \neg Q) \vee (\neg R \vee \neg t)$
T	T	T	T	F	F
T	T	T	F	F	T
T	T	F	T	F	T
T	T	F	F	F	T
T	F	T	T	F	T

Not equivalent; Counter examples highlighted

c)

P	Q	R	t	$\neg(P \vee \neg(Q \vee \neg(R \vee t)))$	$(\neg P \vee \neg Q) \vee (\neg R \vee \neg t)$
T	T	T	T	T	T
T	T	T	F	T	T
T	T	F	T	T	T
T	T	F	F	T	T
T	F	T	T	T	T
T	F	T	F	T	T
T	F	F	T	T	T
T	F	F	F	T	T
F	T	T	T	T	T
F	T	T	F	T	T
F	T	F	T	T	T
F	T	F	F	T	T
F	F	T	T	T	T
F	F	T	F	T	T
F	F	F	T	T	T
F	F	F	F	T	T

Not equivalent; Counter example highlighted

Problem 2:

a) $P \rightarrow Q$

b) $\neg Q \rightarrow P$

Not equivalent; Counter example highlighted

Problem 2:

a. $P \rightarrow Q$

b. $\neg Q \rightarrow P$

c. $Q \rightarrow P$

d. $Q \rightarrow P$

e. $Q \rightarrow P$

Problem 3:

a. The hero is large, and the hero is green, yet has bugs like ants

$$a \wedge b \wedge c$$

b. The muffin man lives on Drury lane, so he must live in Dulce, and has all the Fairies

$$a \leftrightarrow (b \wedge c)$$

c. if the hero accepts the quest, he will fight a dragon, and get his swamp back

$$a \leftrightarrow (b \wedge c)$$

c. if the hero accepts the quest, he will fight a dragon, and get his swamp back

$\begin{array}{ccc} a & b & c \end{array}$

$$a \rightarrow (b \wedge c)$$

d. A princess will turn green if & only if she is cursed, & the sun goes down

$\begin{array}{ccc} a & b & c \end{array}$

$$a \leftrightarrow (b \wedge c)$$

Problem 4).

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

Problem 5:

a. $\begin{array}{l} x = \text{Someone is some} \\ y = \text{Fit to serve on jury} \end{array}$

$\neg x \rightarrow \neg y$
 $a \rightarrow \neg y$
 $a \rightarrow \neg y \rightarrow \neg x \rightarrow \neg z$

1-Problem

x = Someone is some
 y = Fit to serve on jury
 z = Someone can do logic
 a = Someone is your son

$$\neg x \rightarrow \neg y$$

$$a \rightarrow \neg y$$

$$x \rightarrow z$$

$$a \rightarrow \neg y \rightarrow \neg x \rightarrow \neg z$$

1. I avoid people who take the train from Secaucus
2. I avoid people who don't wear mask and are knuckleheads
3. I avoid people who are angry
4. I avoid people who are werewolves and howl at the moon
5. I avoid people from Secaucus who tweet
6. I avoid people on the train who don't ask if I'm happy
7. I avoid people from Jersey that wear mask
8. I avoid people who are werewolves that tweet from their phone
9. I avoid people who are only angry and don't ask if I'm happy
10. I avoid people who are knuckleheads and howl at the moon