Owen Trueblood
Problem Set 1

Problem 3

COLLABORATION On problem 3, I collaborated with no one, and received help from Alex Willisson and Robert Sloan, and referred to wolframalpha.com, wikipedia.org, and mathisfun.com.

a) (P implies Q) OR (Q implies P) ~~can be simplified by the equivalence of P implies Q to NOT(P) OR Q~~

P	Q	(P implies Q)	OR	(Q implies P)
T	T	T	T	T
T	F	F	T	T
F	T	T	T	F
F	F	T	T	T

$(P \to Q) \vee (Q \to P)$ is valid

b) problem: construct R such that it is valid iff P and Q are equivalent.

when $P \neq Q$

F	F
F	T
T	F
T	T

when $P = Q$

T	T
F	F

$R = (\bar{P} \wedge \bar{Q}) \vee (P \wedge Q)$

P	Q	($\bar{P}$	$\wedge$	$\bar{Q}$)	$\vee$	(P	$\wedge$	Q)
T	T	F	F	F	T	T	T	T
T	F	F	F	T	F	T	F	F
F	T	T	F	F	F	F	F	T
F	F	T	T	T	T	F	F	F

$\boxed{R = (\bar{P} \wedge \bar{Q}) \vee (P \wedge Q)}$ is only always true (valid) when P and Q are equivalent.

c) NOT(P) is true only when P is false. For P to be valid according to the proposition, it must be false, which is a contradiction, because a valid proposition can never be false.

d) $\boxed{P_1 \text{ IFF } \overline{P_2} = S}$ forces P_1 to be different than P_2. Because the set $\{P_1, \ldots, P_k\}$ is only consistent if ~~they are~~ the propositions are all true, S forces them to be inconsistent if S is valid.