HOMEWORK 1 SOLUTIONS

MICHELLE BODNAR

Problem 1.2

(a)

P	Q	not(P and Q)
T	T	F
T	F	T
F	T	T
F	F	T

(b)

P	Q	(not P) or (not Q)
T	T	F
T	F	T
F	T	T
F	F	T

(c)

P	Q	P and (not Q)
T	T	F
T	F	T
F	T	F
F	F	F

(d)

P	Q	(not P) or Q
T	T	T
T	F	F
F	T	T
F	F	T

Problem 1.4

(v) is definitely a negation of the original statement. (iv) is a negation if we assume that "bad" means the same thing as "not good". (vii) is the only statement which is equivalent to the original statement.

Problem 1.5

There are two cases to consider. If $a \geq 0$ then $|a| = a$, so we may conclude $|a|^2 = a^2$. If $a < 0$ then $|a| = -a$, so we have $|a|^2 = (-a)^2 = (-1)^2 a^2 = a^2$. □

Problem 2.1(i, ii, ix, xi)

(i) True

(ii) False

(ix) This statement is a bit ambiguous. Each implication on its own, when viewed as a universal statement, is false, so we would expect the entire statement to be false. However, if we view the implications together as part of a universal statement, then it is true that for any fixed value of n, at least one of the implications must hold, making it true. You'll soon be introduced to quantifiers which will allow us to make more precise statements and avoid such ambiguities.

(xi) True

Problem 2.4

(i)

P	Q	P $\implies$ (P or Q)
T	T	T
T	F	T
F	T	T
F	F	T

(ii)

P	Q	(P and Q) $\implies$ P
T	T	T
T	F	T
F	T	T
F	F	T

Problem 2.5

(i)

P	Q	P $\implies$ Q	(not Q) $\implies$ (not P)
T	T	T	T
T	F	F	F
F	T	T	T
F	F	T	T

(ii)

P	Q	P or Q	(not P) $\implies$ Q
T	T	T	T
T	F	T	T
F	T	T	T
F	F	F	F

Problem 2.6

Let q be an integer. There are two cases to consider. If $q \geq 15$ then $7q \geq 105$. If $q \leq 14$ then $7q \leq 98$. Either way, we see $7q \neq 100$ for any value of q, so 7 does not divide 100. $\square$