

Math 8: Homework #1 Solution

1.1-3 f,j,k

Table 1: Problem 3 - f

P	Q	$\sim P$	$\sim Q$	$P \wedge Q$	$\sim (P \wedge Q)$	$\sim P \wedge \sim Q$
T	T	F	F	T	F	F
F	T	T	F	F	T	F
T	F	F	T	F	T	F
F	F	T	T	F	T	T

So $\sim P \wedge \sim Q$ and $\sim (P \wedge Q)$ are not equivalent.

Table 2: Problem 3 - j

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

So $\sim (P \vee Q)$ and $\sim P \wedge \sim Q$ are equivalent.

Table 3: Problem 3 - k

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

So $\sim (P \wedge Q)$ and $\sim P \vee \sim Q$ are equivalent.

1.1-5 b,f,h,i:

- b) We will lose the first game and we will lose the second game.
- f) $x > y$ and $m^2 > 1$
- h) Sue will not choose yogurt or she will choose ice cream.
- i) n is odd or n is a multiple of 5.

1.1-9

Table 4: Problem 9 - a

P	Q	$P \otimes Q$
T	T	F
F	T	T
T	F	T
F	F	F

Table 5: Problem 9 - b

A	B	$A \otimes B$	$A \vee B$	$A \wedge B$	$\sim (A \wedge B)$	$(A \vee B) \wedge \sim (A \wedge B)$
T	T	F	T	T	F	F
F	T	T	T	F	T	T
T	F	T	T	F	T	T
F	F	F	F	F	T	F

So from the truth table, $A \otimes B$ is equivalent to $(A \vee B) \wedge \sim (A \wedge B)$.

1.2-2

- a
 - i If triangles have four sides, then squares have three sides.
 - ii If triangles don't have four sides, then squares don't have three sides.
- b
 - i If 8 is an irrational number, then the moon is made of cheese.
 - ii If 8 is a rational number, then the moon is not made of cheese.
- c
 - i b divides 9 only if b divides 3.
 - ii b does not divide 9 only if b does not divide 3.
- d
 - i f is continuous is sufficient for the differentiability of f .
 - ii f is not continuous only if f is not differentiable.

- e
 - i A sequence a is convergent whenever a is bounded.
 - ii A sequence a is not convergent whenever a is not bounded.
- f
 - i A function f is integrable if f is bounded.
 - ii A function f is not integrable if f is not bounded.
- g
 - i $1 + 1 = 2$ is necessary for $1 + 2 = 3$.
 - ii $1 + 1 \neq 2$ is necessary for $1 + 2 \neq 3$.
- h
 - i The moon is full only when fish bite.
 - ii The moon is not full only when the fish are not biting.
- i
 - i To graduate with honors is sufficient to having a grade point average of 3.0.
 - ii To graduate without honors is sufficient to not having a grade point average of 3.0.

1.2 - 6 a,d

Table 6: Problem 6 - a

P	Q	$Q \wedge P$	$P \Rightarrow Q \wedge P$
T	T	T	T
F	T	F	T
T	F	F	F
F	F	F	T

Table 7: Problem 6 - d

P	Q	$P \vee Q$	$P \wedge Q$	$P \vee Q \Rightarrow P \wedge Q$
T	T	T	T	T
F	T	T	F	F
T	F	T	F	F
F	F	F	F	T

1.2 - 8 b,c,g,h

- b) n is prime $\Rightarrow n = 2 \vee n$ is odd
- c) x is irrational $\Rightarrow x$ is real $\wedge$ not rational.
- g) $\mathbb{B}$ is invertible $\Leftrightarrow \det \mathbb{B} \neq 0$.
- h) $6 \geq n - 3 \Rightarrow n > 4 \vee n > 10$