



CS 135

Problem Set 1

1/25/18

Julia Nelson

"I pledge my honor that I have
abided by the Stevens Honor
System" *J Nelson*

Problem 1:

1a)

$$\neg(p \vee (\neg p \wedge q)) \equiv \neg p \wedge \neg q ?$$

Laws

1. $\neg p \wedge \neg(\neg p \wedge q)$

De Morgan's, proposition

2. $\neg p \wedge (p \vee \neg q)$

De Morgan's, 1

3. $(\neg p \wedge p) \vee (\neg p \wedge \neg q)$

Distributive, 2

4. $F \vee (\neg p \wedge \neg q)$

Complement laws, 3

5. $(\neg p \wedge \neg q) \vee F$

Commutative, 4

6. $(\neg p \wedge \neg q)$

Identity, 5

$$(\neg p \wedge \neg q) \equiv \neg p \wedge \neg q$$

1 b)

1. $A \wedge W \rightarrow P$

2. $\neg A \rightarrow I$

3. $\neg W \rightarrow M$

4. $\neg P$

5. $S \rightarrow \neg I \wedge \neg M$

$\neg S$ (superman doesn't exist)

• if Superman exists: #5

$$S \rightarrow \neg I \wedge \neg M$$

#5 $S \rightarrow \neg I \wedge \neg M$

#2 $\neg A \rightarrow I$

$\neg I \rightarrow A$

Contrapositive, 2

#3 $\neg W \rightarrow M$

$\neg M \rightarrow W$

Contrapositive, 3

therefore $A \wedge W \rightarrow P$ #1

but $\neg P$ #4

$P \wedge \neg P$

contradiction

therefore $\neg S$

Superman does not
exist

Problem 2

#1 There are three people in the cabal.

#2 Either Ed or Yifan or both is not in the cabal (using the De Morgan's law the ^ becomes \neg)

#3 If Sam or Cassidy are in the cabal, everyone is in the cabal.

(Since #2 \neg Ed and Yifan can't both be in the cabal, Sam and Cassidy must not be in the cabal)

#4 If Ed is in the cabal, Yifan is in the cabal.

(Since Ed and Yifan can't both be in the cabal, Ed is not in the cabal but Yifan may be. Using the law that if A implies B, B can't be false while A is true. If B is false A must be false)

#5 If Ryan is in the cabal, Sam is as well.

(Since Sam is not in the cabal, Ryan isn't either. At this point Sam, Cassidy, Ed and Ryan are not in the cabal)

#6 If Jared or Jo is in the cabal,
Katie is not in the cabal

#7 If Jared or Yifan are in the
cabal, David is not in the cabal.

So:

If Jared is in the cabal
Katie and David are not.
~~Therefore~~ Then Jo and Yifan
would be in it.

If Jared is not in the cabal
we ~~do~~ are unable to ~~know~~
find 3 people in the cabal

- Since we can conclude its
~~Jared~~ Katie

(Jo v Katie) ^ (Yifan v David)

So

Jared, Jo, Yifan
are in the
cabal