# Group 1

**Problem 4.3.**

**(a)** *Verify that the propositional formula AND OR AND is equivalent to .*  
 **(b)** *Prove that*

*for all sets, , by showing*

*for all elements using the equivalence of part (a) in a chain of IFF's.*

**(a)** The equality is equivalent to the assertion that

for all . Now we'll prove by a chain of iff's.  
 Now we have

**(b)** The equality is equivalent to the assertion that

for all . Now we'll prove by a chain of iff's.  
Now we have

**Problem 4.5.**  
*Prove De Morgan's Law for set equality*

*by showing with a chain of IFF's that the left-hand side of iff the right-hand side. You may assume the propositional version (3.14) of De Morgan's Law.*

The equality is equivalent to the assertion that

for all . Now we'll prove by a chain of iff's.  
 Now we have

**Problem 4.6.**  
*Powerset Properties.*  
 *Let and be sets.*  
 **(a)** *Prove that*

**(b)** *Prove that*

*with equality holding iff one of or is a subset of the other.*

**(a)** The equality is equivalent to the assertion that

for all . Now we'll prove by a chain of iff's.  
 Now we have

**(b)** The equality is equivalent to the assertion that

for all . Now we'll prove by a chain of iff's.  
Now we have

**Problem 5.4.**  
*Prove by induction on that*

*for all and numbers .*

* is true, because both sides of equation this equal one when
* Assume that is true, that is equation holds for some nonnegative integer . Then adding to both sides of the equation implies that
* which proves   
  So it follows by induction that is true for all nonnegative .

**Problem 5.5.**  
*Prove by induction:*

*for all .*

* is true, because left side of equation is less than right side when
* Assume that is true, that is equation holds for some nonnegative integer . Then adding to both sides of the equation implies that
* which proves
* So it follows by induction that is true for for all .