MATH 201: CLASS DISCUSSION (5 SEPT 2017)

NAÏVE SET THEORY CONTINUED

INTRO TO PROOFS

1. Let A, B and C be three sets such that:

Set A = {2, 4, 6, 8, 10, 12}, set B = {3, 6, 9, 12, 15} and set C = {1, 4, 7, 10, 13, 16}.

Find:

(i) A ∪ B

(ii) A ∩ B

(iii) B ∩ A

(iv) B ∪ A

(v) B ∪ C

(vi) A – B

(vii) A – (B ∪ C)

(viii) A – (B ∩ C)

(ix) Is A ∪ B = B ∪ A?

(x) Is B ∩ C = B ∪ C?

2. Complete each of the following:

(i) Associativity of set union and intersection:

$A \cup (B \cup C) =$ $\qquad$ $A \cap (B \cap C) =$

(ii) Commutativity: $A \cup B =$ $\qquad$ $A \cap B =$

(iii) Distributivity: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$, $\qquad$ $A \cap (B \cup C) =$

(iv) De Morgan Laws: $(A \cup B)^c =$ $\qquad$ $(A \cap B)^c =$

(v) Complementation: $A \cup A^c =$ $\qquad$ $A \cap A^c =$

(vi) Double complement: $(A^c)^c =$

3. True or False? Give proof or counterexample.

(a) $A \cup B \subseteq A \cap B$

(b) $A \cup (B \cap C) \subseteq (A \cup B) \cap (A \cup C)$

(c) $A \cup (B \cap C) \supseteq (A \cup B) \cap (A \cup C)$

(d) $A - (B \cap C) = (A - B) \cup (A - C)$

(e) $A - B = B^c - A^c$

(f) $(A \cup B) \cap C \supseteq (A \cup B) \cap (A \cup C)$

4. [Halmos, **Naïve Set Theory**]

EXERCISE. A necessary and sufficient condition that $(A \cap B) \cup C = A \cap (B \cup C)$ is that $C \subset A$. Observe that the condition has nothing to do with the set B.

5. [Halmos, **Naïve Set Theory**]

(a) Prove that $P(E) \cap P(F) = P(E \cap F)$

(b) Prove that $P(E) \cup P(F) \subseteq P(E \cup F)$