

# Math 131A Lecture 2

## Homework 1 – Due Apr. 6

**Note:** Group work is permitted on the homework provided that each person writes their own answer in their own words. However, to obtain any major benefit from the homework, it is recommended that the student spend significant time and effort attempting each problem before collaborating or seeking help from the teacher/teaching assistant/other students.

**Problem 1:** Using a truth table, verify that for any mathematical propositions  $P, Q$  the following mathematical propositions are true (De Morgan's laws for  $\wedge, \vee$ ):

$$\sim (P \wedge Q) \Leftrightarrow ((\sim P) \vee (\sim Q))$$

$$\sim (P \vee Q) \Leftrightarrow ((\sim P) \wedge (\sim Q))$$

**Problem 2:** Using a truth table, verify that for any mathematical propositions  $P, Q, R$  the following mathematical propositions are true (distributive laws for  $\wedge, \vee$ ):

$$(P \wedge (Q \vee R)) \Leftrightarrow ((P \wedge Q) \vee (P \wedge R))$$

$$(P \vee (Q \wedge R)) \Leftrightarrow ((P \vee Q) \wedge (P \vee R))$$

**Problem 3:** Using a truth table, verify that for any mathematical propositions  $P, Q, R$  the following mathematical proposition is true (this demonstrates the validity of proof by contradiction):

$$(P \Rightarrow Q) \Leftrightarrow ((P \wedge (\sim Q)) \Rightarrow (R \wedge (\sim R)))$$

**From the textbook:**

**Section 1.1:** #1.3,1.4,1.7

**Challenge Problem (Don't turn it in):** Section 1.1 #1.12.