

Introduction to mathematical logic: Homework

Mathematics 170

due Friday, Sept. 24

1. Write the negation of the following sentence: “Donate to a campaign, or knock on doors and stuff envelopes.”
2. Write the contrapositive of the following sentence: “If the war in Iraq improves or the economy improves, Bush will win the election.”
3. Construct a truth table for the statement “NOT (P AND Q) OR R .”
4. Show that the statements “ P OR (Q AND R)” and “(P OR Q) AND (P OR R)” are equivalent, by showing that they have the same truth table.
5. Write the truth table for the statements “IF P , THEN (Q AND R),” “IF (P AND Q), THEN R ,” and “IF P , THEN (IF Q THEN R).” Are any of these equivalent?
6. How many different truth tables could be constructed for an operation between two statements P and Q ? Hint: for each truth value of P and of Q , one can choose either true or false. How many possibilities are there?
7. Write a true if-then statement whose converse is false. Write one whose converse is true.
8. A certain bill came up for a vote in the Senate. If Trent Lott voted for it, Ted Kennedy promised not to vote for it. Jim Jeffords said he’d vote for it only if Lott voted for it. If Kennedy voted for it, then either Jeffords or Lott voted against it.
 - (a) Let J , K , and L denote the statements “Jeffords voted yes,” “Kennedy voted yes,” and “Lott voted yes,” respectively. Assuming everyone kept their promises, write the assumptions above using IF...THEN, NOT, AND, and OR.
 - (b) If Kennedy voted for the bill, determine how Jeffords and Lott voted.