

## Intro Logic Homework #1

A. Determine whether these formulas are tautologies, contradictions, or contingent formulas by using truth tables. Explain your answers (e.g. "this is a tautology because in the final column of the truth table there are only Ts".)

1.  $(P \supset Q) \supset P$
2.  $P \supset P$
3.  $\sim(P \supset Q) \supset (\sim P \& \sim Q)$
4.  $\sim(P \supset Q) \supset (\sim Q \supset \sim P)$
5.  $[(P \supset Q) \& (P \supset R)] \supset [\sim P \supset (Q \& R)]$
6.  $\sim[\sim P \supset (Q \supset R)] \supset [\sim P \& Q]$

B. In each case, for the two given formulas,  $\phi$  and  $\psi$ , use truth tables to answer the following questions (explain your answers): i) does  $\phi$  logically imply  $\psi$ ? ii) does  $\psi$  logically imply  $\phi$ ? iii) are  $\phi$  and  $\psi$  logically equivalent? You may use the short cuts discussed in class.

7.  $\phi : P \supset R$                        $\psi : \sim R \supset \sim P$
8.  $\phi : [(P \& Q) \supset R]$                  $\psi : [P \& (Q \supset R)]$
9.  $\phi : Q \supset R$                          $\psi : R \supset Q$
10.  $\phi : P \supset Q$                          $\psi : (P \supset Q) \& (\sim P \supset \sim Q)$

C. Use truth tables to decide whether the following arguments are valid or invalid; explain your answers. I'll write the arguments in the following form: Premise<sub>1</sub>; Premise<sub>2</sub>; ... Premise<sub>n</sub> / Conclusion

11.  $P \supset \sim Q; \sim Q \supset P / \sim P \supset Q$
12.  $P \supset Q; Q \supset R; \sim R / P$
13.  $P \supset Q; P \supset R; Q \supset R / \sim \sim R$