

Exercise sheet 1

Set theory and Logic, MTH303

1. Use truth tables to prove that the following are tautologies:
 - (a) $P \rightarrow (Q \rightarrow P)$
 - (b) $(P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow [P \rightarrow R])$
 - (c) $(\neg P \rightarrow \neg Q) \rightarrow (Q \rightarrow P)$
2. Show that the first FL axiom, along with modus ponens, allows you to show: $p, q \vdash p$.
3. Show that the second FL axiom, along with modus ponens, allows you to show: $p \rightarrow q, q \rightarrow r, p \vdash r$
4. Show that the third FL axiom, along with modus ponens, allows you to show: $\neg q \rightarrow \neg p, p \vdash q$ (Does this remind you of proving by considering the contrapositive?)