1.

(a) **If I live in Tianjin then I live in China.**

Express as a logical statement. (That is, define propositions P and Q and then write as an if-then implication P$\Rightarrow$Q.)

Write the converse. Is it True?

Write the contrapositive. Is it True?

Write the inverse.   Is it True?

(b) **If two angles are congruent, then they have the same measure.**

Same questions as in (a).

(c)   **If a quadrilateral is a rectangle, then it has two pairs of parallel sides.**

Same questions as in (a).

(d) **If Albertine buys Halloween decorations, then Gilberte raises bats in her basement.**
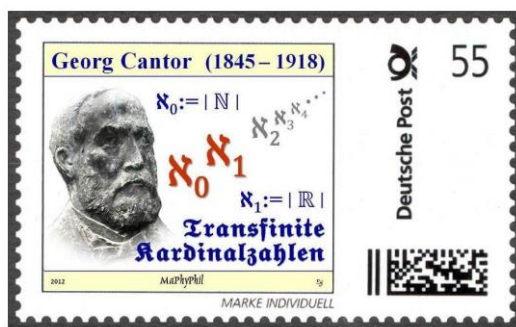
2. Prove (some of) the following tautologies by means of a Truth Table.)

Double negation	$\sim(\sim P) \leftrightarrow P$
DeMorgan's Law	$\sim(P \lor Q) \leftrightarrow (\sim P \land \sim Q)$
DeMorgan's Law	$\sim(P \land Q) \leftrightarrow (\sim P \lor \sim Q)$
Contrapositive	$(P \to Q) \leftrightarrow (\sim Q \to \sim P)$
Modus ponens	$[P \land (P \to Q)] \to Q$
Modus tollens	$[\sim Q \land (P \to Q)] \to \sim P$

3. Let P = "I love algebra", Q = "I like spiders", and R = "I am vegetarian".

Write the following symbolically and then make a truth table.

"If I love algebra or like spiders then I am not a vegetarian."

[Georg Cantor](#), father of modern set theory