Abstract: From the classical logic section on set theory, we evaluate definitions of the atom and primitive set. None is tautologous. From the quantum logic and topology section on set theory, we evaluate the disjoint union (as equivalent to the XOR operator) and variances in equivalents for the AND and OR operators. None is tautologous. This reiterates that set theory and quantum logic are not bivalent, and hence non-tautologous segments of the universal logic $\mathcal{V}_4$. The assertion of Riemannian geometry as generalization of Euclidean geometry is not supported.

We assume the method and apparatus of Meth8/$\mathcal{V}_4$ with $\top$ as tautology, $\bot$ as contradiction, $\Delta$ as truthity (non-contingency), and $\nabla$ as falsity (contingency). The 16-valued truth table is row-major and horizontal, or repeating fragments of 128-tables, sometimes with table counts, for more variables. (See ersatz-systems.com.)

An atom $A^{\neq 0}$ is called a primitive set, that is, $A$ has the property that if $B \subseteq A$ then $B = A$. (4.1.1)

\[ \neg(p < q) > (q = p) > (p @ (s @ s)) ; \quad \text{TTTT TTTT TTTT} \quad (4.1.2) \]

We use the symbolic notation $\tilde{A} \in B$ as an equivalent to the more primitive statement $A \cap B = A$. (4.2.1)

\[ \neg(q < p) = ((p \& q) = p) ; \quad \text{TFFT TFFT TFFT} \quad (4.2.2) \]

In set theory, the equivalent [of $A$ xor $B$] is given by the disjoint union $A \cup B = (A \cup B) / (A \cap B)$ (23.1.1)

\[ (p @ q) = ((p + q) / (p \& q)) ; \quad \text{TTTT TTTT TTTT} \quad (23.1.2) \]

This is ... resolved by insisting that $\neg(A) \cap B = \neg(A \cap B)$ where $A, B$ are ordinary sets. (24.1.1)

\[ (\neg p \& q) = \neg(p \& q) ; \quad \text{FFTT FFFF FFFF FFFF} \quad (24.1.2) \]
Quantum logic and topology: Show that $\lor, \land$ do not in general obey the rule of de Morgan: $P \land (R \lor Q) \neq (P \land R) \lor (P \land Q)$. 

$$p \land (r+q)@((p\land r)+(p\land q)) ; \quad \text{FFFF} \quad \text{FFFF} \quad \text{FFFF} \quad \text{FFFF} \tag{26.1.1}$$

Quantum set theory. Sets are given by objects $P,Q$ and we have again $\land, \lor$ where $P \land P = P = P \lor P$.

$$p\land p=(p=(p+p)) ; \quad \text{FIFT} \quad \text{FIFT} \quad \text{FIFT} \quad \text{FIFT} \quad \text{FIFT} \tag{26.2.1}$$

None of the equations above is tautologous. Eqs. 4 reiterate that set theory is not bivalent. Eqs. 23-26 reiterate that quantum logic does not follow all of the rules of inference from classical logic, hence quantum logic is not bivalent. The assertion of "Riemannian geometry which is a generalization of flat Euclidean geometry" is not supported.