Solution to the traveling salesman problem as a theorem, unrelated to P, NP

Abstract: We evaluate the traveling salesman problem (TSP) to confirm it as a theorem but with *multiple* solutions for n = 4 cities. The number of solutions here is also given by n = 4. Our results do not relate to P, NP, or NP-hard. Hence the salesman problem as an outstanding mathematical problem of optimization is refuted, and as such becomes a non tautologous fragment of the universal logic VŁ4.

We assume the method and apparatus of Meth8/VŁ4 with `T`autology as the designated proof value, **`F`** as contradiction, `N` as truthity (non-contingency), and `C` 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.)

LET ~ Not, ¬ ; + Or, ∨, ∪, ⊔ ; - Not Or; & And, ∧, ∩, ⊓, · , ⊗ ; \ Not And;
> Imply, greater than, →, ⇒, ↦, ≻, ⊃, ↠ ; < Not Imply, less than, ∈, ≺, ⊂, ⊬, ⊭, ↞, ≲ ;
= Equivalent, ≡, :=, ⇔, ↔, ≜, ≈, ≃ ; @ Not Equivalent, ≠, ⊕;
% possibility, for one or some, ∃, ◊, M; # necessity, for every or all, ∀, □, L;
(z=z) `T` as tautology, ⊤, ordinal 3; (z@z) **`F`** as contradiction, Ø, Null, ⊥ , zero;
(%z>#z) `N` as non-contingency, Δ, ordinal 1; (%z<#z) `C` as contingency, ∇, ordinal 2;
~(y < x) (x ≤ y), (x ⊆ y), (x ⊑ y); (A=B) (A~B).
Note for clarity, we usually distribute quantifiers onto each designated variable.

From: en.wikipedia.org/wiki/Travelling_salesman_problem

Conjecture: If distances between cities are unique and not zero, then the relations of unique cities imply the order of respective distances to be traversed as least to greatest. (1.0)

Remark 1.0: We write the conjecture as: If n numbered locations are unique and not zero and the respective distances are unique and not zero, then relations of locations imply the respective distances as assigned sequentially from least to greatest. (1.1)

LET p, q, r, s, t, u, v, w, x, y: city_1, city_2, city_3, city_4, (p-q), (p-r), (p-s), (q-r), (q-s), (r-s).

Remark 1.1: Distance assignments can be mapped separately in one dimension, overlaid from a fiducial point as least to greatest, with no two distances as equal. In vectors, the distances are ordered from t to y as least to greatest:

```
(~(((p&q)&(r&s))=(s@s))&
(~((((t=(p-q))&(u=(p-r)))&(v=(p-s)))&(((w=(q-r))&(x=(q-s)))&(y=(r-s))))=(s@s))) >
((((((p>q)>r)<s)+(((p>q)<r)<s))+((((p<q)>r)<s)+(((p<q)<r)<s)))>(((((t<u)<v)<w)<x)<y)) ;
                              TTTT TTTT TTTT TTTT                  (1.2)
```

Remark 1.2: The solutions by city number relation paths are: (((p>q)>r)<s) ; (((p>q)<r)<s)); (((((p<q)>r)<s); or (((p<q)<r)<s). In this rendition, there are four cities n = 4 and four solutions n = 4.

Eq. 1.2 is tautologous, meaning the conjecture is confirmed. This appears at first glance to support P=NP, but the theorem is logically unrelated to P, NP, or NP-Hard. Hence, the conjecture does not quality as an outstanding mathematical problem of optimization. (No prize incentives exist for removing a problem.)