Refutation of Liouville's theorem as not invertible

We assume Meth8/VŁ4 where the designated *proof* value is Tautology. The truth table is repeating fragments of 16-values, row major and horizontal. LET pqrtw ABRTW; > →, transition

We rely on: inside.mines.edu/~tohno/teaching/PH505_2011/liouville_dvorak.pdf

> Allow *W*(*A*) to denote the phase volume of macrostate *A*, i.e. *W*(*A*) is the number of microstates that realize macrostate *A*[; w]e can immediately conclude that *W* (*RA*) = *W* (*A*). (1.1)

((w&p)>p)>((w&(r&p))=(w&p)) ; `TFTF TFTF TFTF TFTF, TTTT TTTT TTTT TTTT` (1.2)

> Consider two distinct macrostates *A* and *B* in the same phase space. Let Γ denote the microscopic path through phase space that realizes the macroscopic transition *A* → *B*. Denote the transformed macrostate *A* as *TA* for time evolved *A*. Liouville's theorem preserves phase space volumes. Therefore, *W*(*TA*) = *W*(*A*). We now consider only cases where the transition *A* → *B* is experimentally reproducible. For [Figure 3: Evolution of macrostates in a dynamical system.] this to be true, *TA* must lie entirely in *B*. We cannot control which microstate the system evolves into, but we require that all evolved microstates *TA* are a subset of *B*. This condition implies that *W*(*TA*) < *W*(*B*). The number of microstates for macrostate *B* is greater than that of macrostate *A*. But Liouville's theorem tells us *W*(*TA*) = *W*(*A*), so experimental reproducibility of *A* → *B* means that *W*(*A*) < *W*(*B*). This condition depends only on the initial configuration of the system because phase space volume is conserved. This is the requirement for experimental reproducibility and one explanation for entropy, *S*/ln*W*. (2.1)

(((w&(t&p))=(w&q))&((w&(t&p))<(w&p))) > ((p>q)=((w&p)<(w&q))) ;
`TTTT TTTT TTTT TTTT` ; (2.2)

> Consider the reverse transition: why does macrostate *B* not evolve into *A*. This is equivalent to the transition *RB* → *RA*. This transition requires additional information about the initial microstate of *RB* to transform it into the proper sub-region of *RA* - information we don't typically have. Because *W*(*RA*) < *W*(*RB*), this transformation is not experimentally reproducible. Liouville's theorem connects the time evolved state to the initial state - their phase space volume are the same. Therefore, Liouville's theorem places the requirement for experimental reproducibility (second law) on initial and final states *S*(*A*) < *S*(*B*). Interestingly, nowhere does any notion of time enter this argument. In this derivation, increasing entropy is a requirement only for experimental reproducibility, not a forward direction in time.

(w&(r&p))<(w&(r&q))) > ~((q>p)=((r&q)>(r&p))) ;
`TTTT TTTT TTTT TTTT, TTTT TFTT TTTT T`**F**`TT` (3.2)

Eq. 1.2 is *not* tautologous: it is not a theorem. Eq. 2.2 is tautologous: it is a constructive theorem.

However, Eq. 3.2 is *not* tautologous: as the reverse of Eq.2.2, it is not a theorem. This means Liouville's theorem is not invertive and hence not a reversible theorem.