P=NP resolution, with 3-SAT not tautologous

1. **NP**

We use the definition of NP as "nondeterministic polynomial time" from Stephen Cook at claymath.org/sites/default/files/pvsnp.pdf as:

$$w \in L \Longleftrightarrow \exists y(|y| \leq |w|^k \text{ and } R(w, y)) \quad (1)$$

where:

$$R(w, y) \Longleftrightarrow w \in L \quad (2)$$

$$R(\sim a, \sim b) \Longleftrightarrow 1 < b < a \text{ and } b|a \qquad \text{(with negation replacing the obtuse vinculum)} \quad (3)$$

We substitute the expression $R(a, b)$ as:

$$R(\sim a, \sim b) \Longleftrightarrow [\, R(w, y) \Longleftrightarrow 1 < b < a \text{ and } b|a \,] \quad (4)$$

then substitute $R(w, y)$ in Eq. 1 with Eq. 4 for:

$$w \in L \Longleftrightarrow \exists y(|y| \leq |w|^k \text{ and } [\, R(\sim a, \sim b) \Longleftrightarrow [\, R(w, y) \Longleftrightarrow 1 < b < a \text{ and } b|a \,]\,]. \quad (5.1)$$

We assume the apparatus and method of Meth8/VŁ4.

LET: a b L R (w,y) as t u p q (w, y); (r, s) = (w, y)
~ Negation, % modal possibility, existential quantifier for all, ∃;
& And, \ Not And, + Or, - Not Or, = Equivalent, @ Not Equivalent, > Imply, < Not Imply;

and where:

|w| :: (w+((w<((w\w)-(w\w)))>(w&((w\w)-((w\w)-(w\w)))))); (6)
|y| :: (y+((y<((y\y)-(y\y)))>(y&((y\y)-((y\y)-(y\y)))))); (7)
|y| <= |w| :: (y' = w') or (y' < w') :: |w| > |y|. (8)

We note that in the modal propositional logic of Meth8, as based on system VŁ4, an exponential expression reduces to the mantissa such that w^3 is w&w&w = w. This means that in Eq. 5.1 the power series term $|w|^k$, with k as a natural number, reduces to $|w|$. In other words, in Meth8 a power series is effectively reduced to a linear expression.

(w<p) = (%y&(((w+((w<((w\w)-(w\w)))>(w&((w\w)-((w\w)-(w\w))))))>(y+((y<((y\y)-
(y\y)))>(y&((y\y)-((y\y)-(y\y)))))))&((q&(~r&~s))=((q&(w&y))=(((t\t)<(t<u))&(t+u)))))) ;
(5.2)

Eq. 5.2 is evaluated on the five logical models of Meth8 as *not* tautologous.

The truth table for Eq. 5.2 is presented as two different segments of two repeating blocks of 16 lines below. The designated truth values are `T`autologous and `E`valuated.

```
(w<p)=(%y&(((w+((w<((w\w)-(w\w)))>(w&((w\w)-((w\w)-(w\w))))))>(y+((y<((y\y)-(y\y)))>(y&((y\y)-((y\y)-(y\y)))))))&((q&(~r&~s))=((q&(w&y))=(((t\t)<(t<u))&(t+u)))))) ;  Step: 81; not tautologous for: =, >, <.
```

Model 1	Model 2.1	Model 2.2	Model 2.3.1	Model 2.3.2
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
NNTT NNNN NNNN NNNN	EEEE EEEE EEEE EEEE	UUEE UUUU UUUU UUUU	IIEE IIII IIII IIII	PPEE PPPP PPPP PPPP
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
NNTT NNNN NNNN NNNN	EEEE EEEE EEEE EEEE	UUEE UUUU UUUU UUUU	IIEE IIII IIII IIII	PPEE PPPP PPPP PPPP
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
CNFT CNCN CNCN CNCN	UEUE UEUE UEUE UEUE	EUUE EUEU EUEU EUEU	PIUE PIPI PIPI PIPI	IPUE IPIP IPIP IPIP
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
CNFT CNCN CNCN CNCN	UEUE UEUE UEUE UEUE	EUUE EUEU EUEU EUEU	PIUE PIPI PIPI PIPI	IPUE IPIP IPIP IPIP
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
NNTT NNNN NNNN NNNN	EEEE EEEE EEEE EEEE	UUEE UUUU UUUU UUUU	IIEE IIII IIII IIII	PPEE PPPP PPPP PPPP
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
NNTT NNNN NNNN NNNN	EEEE EEEE EEEE EEEE	UUEE UUUU UUUU UUUU	IIEE IIII IIII IIII	PPEE PPPP PPPP PPPP
TTNN TTTT TTTT TTTT	EEEE EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEII EEEE EEEE EEEE	EEPP EEEE EEEE EEEE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
CNFT CNCN CNCN CNCN	UEUE UEUE UEUE UEUE	EUUE EUEU EUEU EUEU	PIUE PIPI PIPI PIPI	IPUE IPIP IPIP IPIP
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
CNFT CNCN CNCN CNCN	UEUE UEUE UEUE UEUE	EUUE EUEU EUEU EUEU	PIUE PIPI PIPI PIPI	IPUE IPIP IPIP IPIP
FTCN FTFT FTFT FTFT	UEUE UEUE UEUE UEUE	UEEU UEUE UEUE UEUE	UEPI UEUE UEUE UEUE	UEIP UEUE UEUE UEUE
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FFTT FFFF FFFF FFFF	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FFTT FFFF FFFF FFFF	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
TFTF TFFT TFFT TFFT	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
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TFTF TFFT TFFT TFFT	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FFTT FFFF FFFF FFFF	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
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TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FFTT FFFF FFFF FFFF	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU	UUEE UUUU UUUU UUUU
TTFF TTTT TTTT TTTT	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE	EEUU EEEE EEEE EEEE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
TFTF TFFT TFFT TFFT	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
TFTF TFFT TFFT TFFT	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE	EUEU EUUE EUUE EUUE
FTFT FTTF FTTF FTTF	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU	UEUE UEEU UEEU UEEU
Model 1	Model 2.1	Model 2.2	Model 2.3.1	Model 2.3.2

2. **P**

We use the definition of P as "deterministic polynomial time", that is, ~NP as the negation of Eq. 5.1.

3. Problem statement: *Does* **P** = **NP***?* (9.1)

We test Eq. 9.1 as equivalent to Eq. 5.1. For ~NP = NP, obviously the expression is contradictory.

4. 3-SAT

Cook describes an example of the 3-SAT test as NP-complete for the expression (with negation replacing the vinculum):

$$(p \lor q \lor r) \land (\sim p \lor q \lor \sim r) \land (p \lor \sim q \lor s) \land (\sim p \lor \sim r \lor \sim s) \tag{10.1}$$

((p+(q+r)) & (~p+(q+~r))) &((p+(~q+s)) & (~p+(~r+~s))) ;
`FTFT TFFT FTTT TFTF` (10.2)

with

$$\tau(P) = \tau(Q) = \textit{Tautologous} \text{ and } \tau(R) = \tau(S) = \textit{contradictory} \tag{11.1}$$

(((p=q)=(p=p))&((r=s)=(r@r))) ; `FFFF TFFT TFFT FFFF` (11.2)

Eqs. 10.2 and 11.2 as rendered are *not* tautologous.

We combine Eq. 10.1 and its qualification with clause of Eq. 11.1.

$$\text{If } \tau(P) = \tau(Q) = \textit{Tautologous} \text{ and } \tau(R) = \tau(S) = \textit{contradictory}, \text{ then}$$
$$(p \lor q \lor r) \land (\sim p \lor q \lor \sim r) \land (p \lor \sim q \lor s) \land (\sim p \lor \sim r \lor \sim s) \tag{12.1}$$

(((p=q)=(p=p))&((r=s)=(r@r))) > (((p+(q+r))&(~p+(q+~r)))&((p+(~q+s))&(~p+(~r+~s)))) ;
`TTTT TTTT FTTT TTTT` (12.2)

Eq. 12.2 as rendered is *not* tautologous, but nearly so with deviation by one `F` value. This means the 3-SAT test is *not* tautologous, and hence incapable of testing NP-completeness.

What follows is that the logical foundation supporting satisfiability is suspicious.