Meth8/VŁ4 on one and three in arithmetic

Abstract: We evaluate arithmetic using 0 and 3 as binary 00 and 11.. Arithmetic holds in nine theorems. For division by zero, the result is Not(0 and 3).

We assume the method and apparatus of Meth8/VŁ4 with Tautology 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, ∅, Null, ⊥, zero;
(%z<#z) C as contingency, Δ, ordinal 1; (%z>#z) N as non-contingency, ∇, ordinal 2;
~(y < x) (x ≤ y), (x ⊆ y); (A=B) (A~B).
Note: For clarity we usually distribute quantifiers on each variable as designated.

LET (r=r) ordinal 3; (r@r) number 0.

Subtraction:

If 3>0, then 3-3=0. (1.1)

((r=r)>(r@r))>(((r=r)-(r=r))<(r=r)) ; TTTT TTTT TTTT TTTT (1.2)

If 3>0, then 3-0=3. (2.1)

((r=r)>(r@r))>(((r=r)-(r@r))=(r=r)) ; TTTT TTTT TTTT TTTT (2.2)

Addition:

If 3>0, then 3+3>3. (3.1)

((r=r)>(r@r))>(((r=r)+(r=r))>(r=r)) ; TTTT TTTT TTTT TTTT (3.2)

If 3>0, then 3+0=3. (4.1)

((r=r)>(r@r))>(((r=r)+(r@r))=(r=r)) ; TTTT TTTT TTTT TTTT (4.2)

Multiplication:

If 3>0, then 3*3>3. (5.1)

((r=r)>(r@r))>(((r=r)&(r=r))>(r=r)) ; TTTT TTTT TTTT TTTT (5.2)

If 3>0, then 3*0=0. (6.1)

((r=r)>(r@r))>(((r=r)&(r@r))=(r@r)) ; TTTT TTTT TTTT TTTT (6.2)

Division:

If 3>0, then 0/3=0. (7.1)

((r=r)>(r@r))>(((r@r)\(r=r))=(r@r)) ; TTTT TTTT TTTT TTTT (7.2)

If 3>0, then 3/3>0. (8.1)

((r=r)>(r@r))>(((r=r)\(r=r))>(r@r)) ; TTTT TTTT TTTT TTTT (8.2)

If 3>0, then 3/0=~(0 and 3). (9.1)

((r=r)>(r@r))>(((r=r)\(r@r))>~((r@r)&(r=r))) ; TTTT TTTT TTTT TTTT (9.2)

Arithmetic holds as theorems in Eqs. 1.2-9.2.