

# composite[COMPOSE,cross[composite[INVERSE,PLUS],PLUS]]

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```
<< goedel52.q68; << tools.m

:Package Title: goedel52.q68          2002 December 17 at 8:35 a.m

It is now: 2002 Dec 18 at 13:12

Loading Simplification Rules

TOOLS.M                               Revised 2002 November 30

weightlimit = 40
```

## ■ summary

In this notebook a formula for the natural map for the equivalence relation **EQUIDIFF** is derived, relating it to the function **PLUS** that takes each natural number to the corresponding non-negative integer.

## ■ derivation

To speed up the derivation, the **simplify** flag is turned off.

```
simplify = False;
```

The **TriNormality** test applied to the natural map yields a complicated mess. Turning it around yields a simplification rule:

```
composite[VERTSECT[EQUIDIFF], id[cart[omega, omega]]] // TriNormality // Reverse

composite[
  intersection[complement[fix[composite[complement[fix[composite[inverse[FIRST],
    inverse[FIRST], rotate[NATADD], intersection[composite[inverse[FIRST],
      rotate[inverse[power[SUCC]]], cross[SECOND, composite[FIRST, FIRST]]],
        composite[inverse[SECOND], SECOND, FIRST, SECOND]]]], inverse[E], SECOND]]],
    complement[fix[composite[fix[composite[inverse[FIRST], inverse[FIRST],
      rotate[NATADD], intersection[composite[inverse[FIRST],
        rotate[inverse[power[SUCC]]], cross[SECOND, composite[FIRST, FIRST]]],
          composite[inverse[SECOND], SECOND, FIRST, SECOND]]]],
            complement[inverse[E]], SECOND]]]],
  id[cart[omega, omega]] == composite[VERTSECT[
    EQUIDIFF], id[
      cart[
        omega, omega]]]
```

This rule is put in place as a temporary rewrite rule.

```

composite[
  intersection[complement[fix[composite[complement[fix[composite[inverse[FIRST],
    inverse[FIRST], rotate[NATADD], intersection[composite[inverse[FIRST],
      rotate[inverse[power[SUCC]]], cross[SECOND, composite[FIRST, FIRST]]],
        composite[inverse[SECOND], SECOND, FIRST, SECOND]]]], inverse[E], SECOND]]],
    complement[fix[composite[fix[composite[inverse[FIRST], inverse[FIRST], rotate[
      NATADD], intersection[composite[inverse[FIRST], rotate[inverse[power[SUCC]]],
        cross[SECOND, composite[FIRST, FIRST]]], composite[inverse[SECOND],
          SECOND, FIRST, SECOND]]]], complement[inverse[E], SECOND]]]],
  id[cart[omega, omega]] := composite[VERTSECT[EQUIDIFF],
  id[
    cart[omega, omega]]]

```

The formula we want is now obtained by using `VSTriNormality`.

```

composite[COMPOSE, cross[composite[INVERSE, PLUS], PLUS]] // VSTriNormality

composite[COMPOSE, cross[composite[INVERSE, PLUS], PLUS]] ==
  composite[VERTSECT[EQUIDIFF], id[cart[omega, omega]]]

composite[COMPOSE, cross[composite[INVERSE, PLUS], PLUS]] :=
  composite[VERTSECT[EQUIDIFF], id[cart[omega, omega]]]

```