In the debating club n°35

Supplements

A collection of palindromes, mirrors, and antimirrors
Palindromics – games with numbers and structures or a useful tool?

Supplement 1

$$\sin(x \pm y) = \sin x * \cos y \pm \cos x * \sin y$$

$$\cos(x \pm y) = \cos x * \cos y \mp \sin x * \sin y$$

or with $\cos x = \sin' x$

$$\sin(x \pm y) = \sin x * \sin' y \pm \sin' x * \sin y$$

$$\sin'(x \pm y) = \sin' x * \sin' y \mp \sin x * \sin y$$

in determinant representation (see [1])

$$\begin{pmatrix} \sin(x+y) & \sin(x-y) \\ \sin'(x+y) & \sin'(x-y) \end{pmatrix}$$

$$= \begin{pmatrix} \sin x & \sin' x \\ \sin' x & -\sin x \end{pmatrix} \begin{pmatrix} \sin' y & \sin' y \\ \sin y & -\sin y \end{pmatrix}$$

$$\left.\begin{array}{l}\left(u(x)*v(x)\right)' \\ (v(x))^2\left(\dfrac{u(x)}{v(x)}\right)'\end{array}\right\} = u'(x)*v(x) \pm u(x)*v'(x)$$

How about

$u'(x)*v'(x) \pm u(x)*v(x) = ???$

Or more compact

$$\begin{pmatrix} u(x) & u'(x) \\ u'(x) & u(x) \end{pmatrix}\begin{pmatrix} v'(x) & v'(x) \\ v(x) & -v(x) \end{pmatrix} =$$

$$\begin{pmatrix} u(x)v'(x)+u'(x)v(x) & u(x)v'(x)-u(x)'v(x) \\ u'(x)v'(x)+u(x)v(x) & u(x)'v'(x)-u(x)v(x) \end{pmatrix}$$

$$= \begin{pmatrix} (u(x)v(x))' & -(v(x))^2\left(\dfrac{u(x)}{v(x)}\right)' \\ ??? & ??? \end{pmatrix}$$

Find more!

Reference

[1] http://mathworld.wolfram.com/TrigonometricAdditionFormulas.html

$$\sinh(x \pm y) = \sinh x * \cosh y \pm \cosh x * \sinh y$$

$$\cosh(x \pm y) = \cosh x * \cosh y \pm \sinh x * \sinh y$$

or with $\cosh x = \sinh' x$

$$\sinh(x \pm y) = \sinh x * \sinh' y \pm \sinh' x * \sinh y$$

$$\sinh'(x \pm y) = \sinh' x * \sinh' y \pm \sinh x * \sinh y$$

in determinant representation

$$\begin{pmatrix} \sinh(x+y) & \sinh(x-y) \\ \sinh'(x+y) & \sinh'(x-y) \end{pmatrix}$$

$$= \begin{pmatrix} \sinh x & \sinh' x \\ \sinh' x & \sinh x \end{pmatrix} \begin{pmatrix} \sinh' y & \sinh' y \\ \sinh y & -\sinh y \end{pmatrix}$$

Find more!

Supplement 2

A palindromic decimal number

** $0.1234567898765432 1 =$
$0.(12345678987654321)^{\underline{1}} =$
$[0;8,9,1,617283,18,526315784487 5346,$
$1,2,2,1,1,2,1,20,6,1,12,1,1709,\ldots]$

** For comparison see

http://mathworld.wolfram.com/ChampernowneConstant.html

0.12345678910111213141516171819 20…
=[0,8,9,1,149083,1,1,1,4,1,1,1,3,4,1,1,1,15,
4575401113910310764836466282429561
1859960393971045755500066200439 30
9026265925631493795320774712865 63
1386412093755035520946071830899 84
5758014698631488335921417830109 87,
6,1,1,21,1,9,1,1,2,3,1,7,2,1,83,1,156,4,58,
8,54,…]

** 0.123456789876543212345678987654321
= 0.(1234567898765432 1)$^{\underline{2}}$ =
[0;8,9,1,617283,18,
526315784487534676 04 607035581372,
1,1,2,7,4,1,1,4,3,1,1,14,13,1,3,1,2,1,4,…]

** 0.1234567898765432 1per.m =
0.(1234567898765432 1)$^{\underline{m}}$ =
[0;8,9,1,617283,18,monster(m),…]

monster(1)=526315784487534 6

monster(2)=
526315784487534676046070355813 72

monster(3)=
526315784487534676046070355813726503059803422663
monster(4)=
526315784487534676046070355813726503059803422663580748765042499
monster(5)=
526315784487534676046070355813726503059803422663580748765042499402653946527712
monster(6)=
526315784487534676046070355813726503059803422663580748765042499402653946527712608698796057209893
= s(1)s(2)s(3)s(4)s(5)s(6)
s(1)= 526315784487534
s(2)= 760460703558137
s(3)= 650305980342266
s(4)= 580748765042499
s(5)= 026539465277126
s(6)= 869879605720989
s(7)= 188005201677897
s(8)= 2719889290905205
s(9)= 4162658923243505
s(10)=2227597343277683

s(11)=3385671964939827
s(12)=8762841146717285
s(13)=3403775133370408
s(14)=4912475781532882
s(15)=5165962486929454
s(16)=4668049707720026
s(17)=6882736929938283
s(18)=1210201437479053
s(19)=9144626546918225
s(20)=0246937973814178

Man erkennt jetzt schon experimentell:
** monster(m) ist Anfangsteil von
monster(m+1)=monster(m)○s(m+1)
** monster(m) ist eine (16m)-stellige Dezimalzahl.
Extrem starker Anstieg von monster(m)!

Your problem:
Interpretation of the monster structure and the monster segments s(m).

Supplement 3

A sawtooth decimal number

** 0.123456789 = $0.\overline{(123456789)^{1}}$ =
[0;8,9,1,135666,15,8,…]
** 0.123456789123456789
= $0.\overline{(123456789)^{2}}$ =
[0;8,9,1,…]
** 0.123456789per.m =
$0.\overline{(123456789)^{m}}$ =
[0;8,9,1,…]

Supplement 4

A palindromic scf

** [0;1,2,3,4,5,6,7,8,9,8,7,6,5,4,3,2,1] =
0.69777465796396573706954656855711789478 0…
** For comparison see
Continued fraction constant
C = [0;1,2,3,4,5,6,7,8,9,10,11,12,13,14,…]
= 0.69777465796400798200679059255175259948665826299802123236863008281653085276464111299696565418267656872398 2…

** [0;1,2,3,4,5,6,7,8,9,8,7,6,5,4,3,2,1,
2,3,4,5,6,7,8,9,8,7,6,5,4,3,2,1] =
0.69777…

** [0;1,2,3,4,5,6,7,8,9] = $\frac{516901}{740785}$

$= 0.697774658...$

** [0;1,2,3,4,5,6,7,8,9,1,2,3,4,5,6,7,8,9] =

Supplement 5

$1^2 = 1$
$11^2 = 121$
$111^2 = 12321$
$1111^2 = 1234321$
$11111^2 = 123454321$
$111111^2 = 12345654321$
$1111111^2 = 1234567654321$
$11111111^2 = 123456787654321$
$111111111^2 = 12345678987654321$

1:9 = 0.1per.
11:9 = 1.2per.
111:9 = 12.3per.
1111:9 = 123.4per.
11111:9 = 1234.5per.

111111:9 = 12345.6per.
1111111:9 = 123456.7per.
11111111:9 = 1234567.8per.
111111111:9 = 12345678.9per. = 12345679

Supplement 6

$ab^{\overline{2k}}a:11 = \underbrace{acac...c...caca}_{2k+1 \text{ digits}}$; $a \leq b \in \{1,2,...,9\}$;

$k \in \mathbb{N}$; $c = b - a$

Examples

277772:11=25252

49999994:11=4545454

133331:11=12121

111111:11=10101

Unter Beibehaltung des Palindromcharakters entsteht hier aus einer (bis auf die "Endstücke") monotonen Ziffernfolge unter Beibehaltung der Endstücke eine alternierende Ziffernfolge!

$$aba^{\underline{2k}}ba:11 = \underbrace{acdcd...d...dcdca}_{2k+3 \text{ digits}} ;$$

$$a \le b \in \{1,2,...,9\} ; 2a \ge b ;$$

$$c = b - a ; d = 2a - b ;$$

$$k \in \mathbb{N}$$

Examples

$454454 : 11 = 41314$

$454444444454 : 11 = 41313131314$

$36333363 : 11 = 3303033$

$4744444474 : 11 = 431313134$

Unter Beibehaltung des Palindromcharakters entsteht hier aus einer (bis auf die "Endstücke") monotonen Ziffernfolge unter Beibehaltung der Endziffern eine alternierende Ziffernfolge!

Food for thought: search for other structure generators of this type.

References

http://de.wikipedia.org/wiki/Palindrom
http://en.wikipedia.org/wiki/Palindrome
http://en.wikipedia.org/wiki/Palindromic_sequence
http://de.wikipedia.org/wiki/Zahlenpalindrom
http://en.wikipedia.org/wiki/Palindromic_number
http://www.mathematische-basteleien.de/palindrom.htm