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3D SMARANDACHE FUNCTIONS

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1. INTRODUCTION

Prof. Dr. Math. Florentin Smarandache, former Head of the Science and Mathematics Department of Gallup University in New Mexico, USA, is an admirer and staunch supporter of the *new mathematics*, of the "Selariu Supermathematics" as he called it, in the idea of preserving Romanian world supremacy over it, considering that it will constitute the "Mathematics of the Third Millennium" or the "Mathematics of the Future".

We reproduce from the ART-EMIS Academy magazine:

The DacoRoman Academy in Bucharest, Romania, nominated the avant-garde trilingual writer (Romanian-French-English) Florentin Smarandache for the 2011 Nobel Prize for Literature." No trilingual writer has received the Nobel Prize to date. He is a laureate of the "Traian Vuia" award of the Romanian Academy, we add.

Professor Florentin Smarandache published 75 books of literature written in the following languages: Romanian, French, or English; some of them have been translated into Chinese, Russian, Arabic, Spanish, Portuguese, Serbo-Croatian, etc. One can download many of them from the University of New Mexico website: http://fs.gallup.unm.edu//eBooksLiterature.htm.

His books are also available on Amazon.com, Amazon Kindle, Google Book Search, Google Scholar, Library of Congress (Washington D.C.) and in many libraries around the world. He has a vast body of work and tackled all literary genres: poetry, prose, theater, essays, translations. He reflects today's globalism very well as a writer as he has lived and visited over 40 countries, written his travel memoirs and diaries, and created in many styles and on many subjects due to his multicultural background and encyclopedic knowledge in many fields.

He is also a polyglot. It corresponds to Albert Nobel's Testament regarding "the greatest benefit done to humanity", because paradoxism, the literary movement he initiated, is now used - through the Dezert-Smarandache Paradoxical and Plausible Reasoning Theory (abbreviated DSmT) - in medicine, cybernetics, aerospace research, robotics, logic, philosophy, transdisciplinarity (interconnecting literature and science, paving the way to new developments in literature).

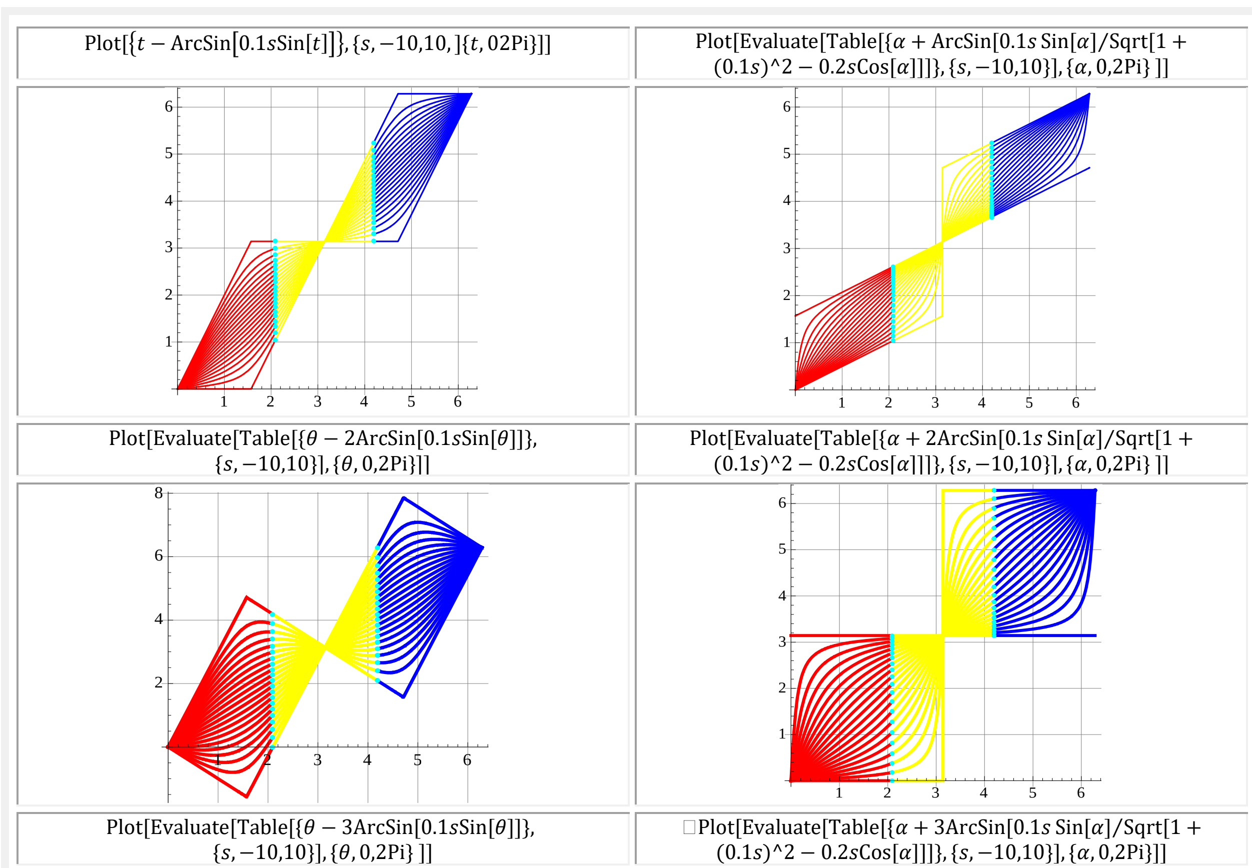
Paradoxism is the first literary avant-garde in the world with practical applications in science. He is also multi-talented and, through his high and varied avant-garde literary experiments, he has produced a remarkable work in an ideal direction, in accordance with the Testament of Alfred Nobel, for the benefit of humanity. As a complete writer, he wrote and published: poetry, drama, novels, short stories, essays, diaries, but also linguistic articles, mathematics textbooks and research papers, computer programs, philosophy and translations (from French, English, Spanish, Portuguese and Italian in Romanian), philatelist. He himself translated some of his books from Romanian into French and English.

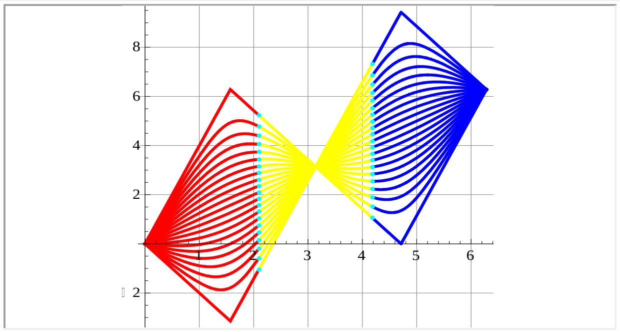
For the contributions made to the development of mathematics, for the new ***supermathematical*** objects (**SM**) created, such as: the conopyramid, the spherocube, the cylinder of triangular section, the square and any other polygon, etc. the author was accepted as an honorary member of the "International Association of Paradoxism, Avangard Movement in Art and Science". In honor of this great Romanian, who honors Romania and the world in particular, the author of the excentric circular supermathematical functions named some **SM** functions in "***Smarandache functions in steps***" (Fig. 2). They are **SMF—EC** of numerical linear excentricity with **s = ± 1**. The **Smarandache functions in steps** are **SMF— EC** excentric amplitude **aexθ** and **Aexα** of numerical excentricity **s ∊ [-1 +1]** and equations:

$$(1)\qquad \begin{cases} aex\theta = \theta - \arcsin\left[s.\sin(\theta-\varepsilon)\right] \\ Aex\alpha = \alpha + arcsin\frac{s.\sin(\alpha-\varepsilon)}{\sqrt{1+s^2-2s\cos(\alpha-\varepsilon)}} \end{cases},$$

with the graphs in Figure 1 which, for **s = ± 1**, become **Smarandache flat functions in steps**:

$$(2)\qquad \begin{cases} aex\theta = \theta - \boldsymbol{bex\theta} = \theta - \arcsin\left[\sin(\theta-\varepsilon)\right] \\ Aex\alpha = \theta - \boldsymbol{Bex\alpha} = \alpha + arcsin\frac{\sin(\alpha-\varepsilon)}{\sqrt{2-2s\cos(\alpha-\varepsilon)}} \end{cases}$$





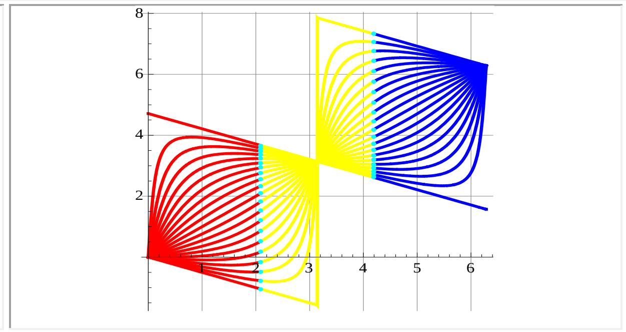
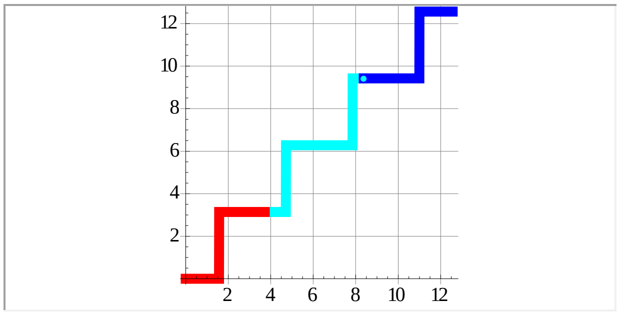
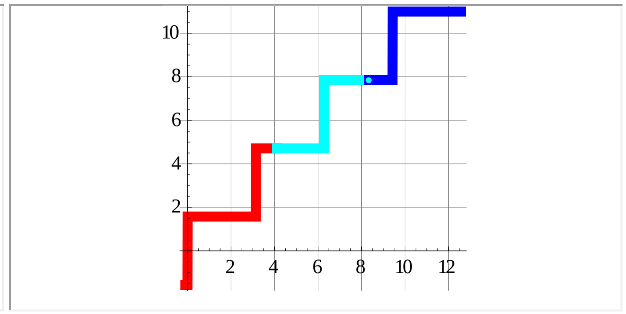


Fig. 1 SMF—EC excentric amplitude **aexθ** and Aexα ▲ **and with 2bexθ and 2Bexα ● and with 3bexθ and 3Bexα ▼**

ParametricPlot[{t, t − ArcSin[Sin[t]] Cos[t]/Sqrt[1 − Sin[t]^2]}, {t, 0,4Pi}]] → **s = +1**

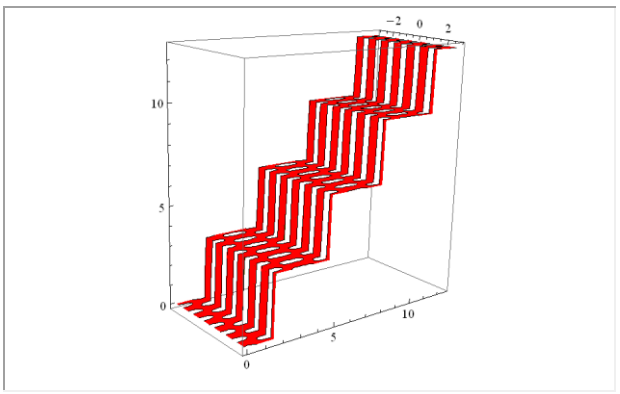
ParametricPlot[{t, t + ArcSin[Cos[t]] Sin[t]/Sqrt[1 − Cos[t]^2]}, {t, −0.1,4Pi}]] → **s = − 1**

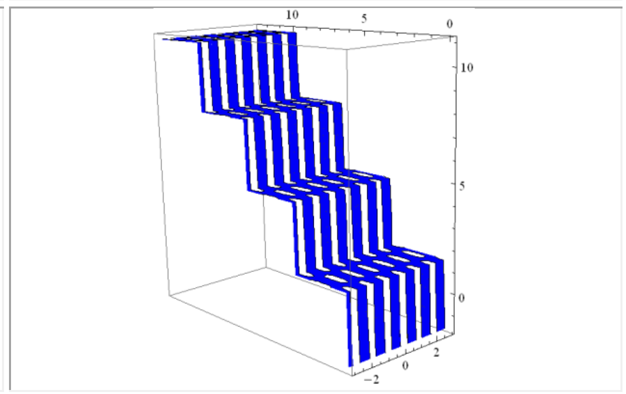




ParametricPlot3D[{t, t − ArcSin[0.1sSin[t]]Cos[t]/ Sqrt[1 − 0.1sSin[t]^2],0.3s}, {s, −10,10}, {t, 0,4Pi}]

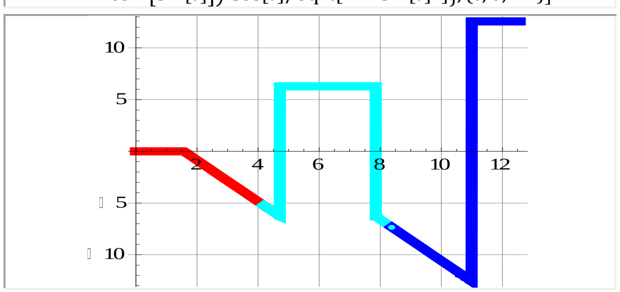
ParametricPlot3D[{t, t + ArcSin[Cos[t]]Sin[t]/ Sqrt[1 − Cos[t]^2],0.3s}, {s, −10,10}, {t, −0.1,4Pi}]

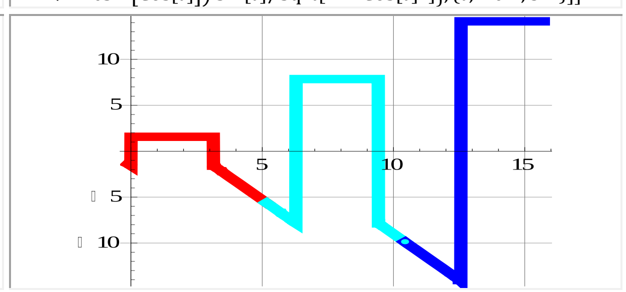




ParametricPlot[{t, (t − ArcSin[Sin[t]]) Cos[t]/Sqrt[1 − Sin[t]^2]}, {t, 0,4Pi}]

ParametricPlot[{t, (t + ArcSin[Cos[t]]) Sin[t]/Sqrt[1 − Cos[t]^2]}, {t, −0.1, 5Pi}]]





ParametricPlot3D[{t, (t − ArcSin[Sin[t]]) Cos[t]/Sqrt[1 − Sin[t]^2] , 0.5s}, {s, −10,10}, {t, −0.1,6Pi}]

ParametricPlot3D[{t, (t + ArcSin[Cos[t]]) Sin[t]/Sqrt[1 − Cos[t]^2] , 0.3s}, {s, −10,10}, {t, −0.1,4Pi}]

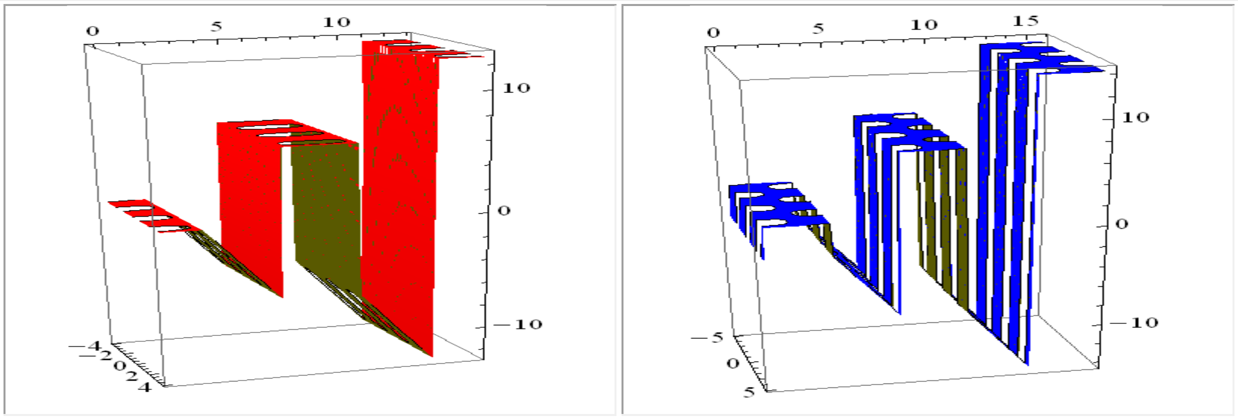
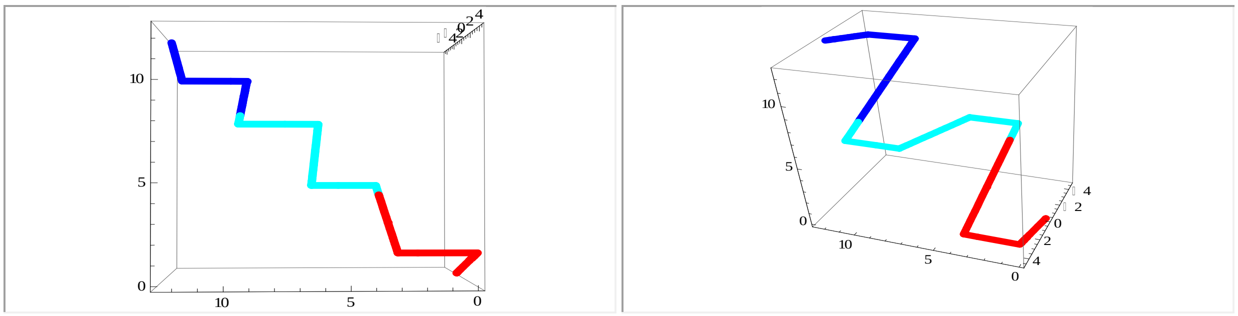


Fig. 2 Smarandache functions in steps

ParametricPlot3D[{$t, t - \text{ArcSin}[\text{Sin}[t]]\ \text{Cos}[t]/\text{Sqrt}[1 - \text{Sin}[t]^2]$, 3ArcSin[Sin[$t$]]}, {$t$, 0,4Pi}]]



ParametricPlot3D[{$t, (t - \text{ArcSin}[\text{Sin}[t]])\ \text{Cos}[t]/\text{Sqrt}[1 - \text{Sin}[t]^2]$, 3ArcSin[Sin[$t$]]}, {$t$, 0,4Pi}]]

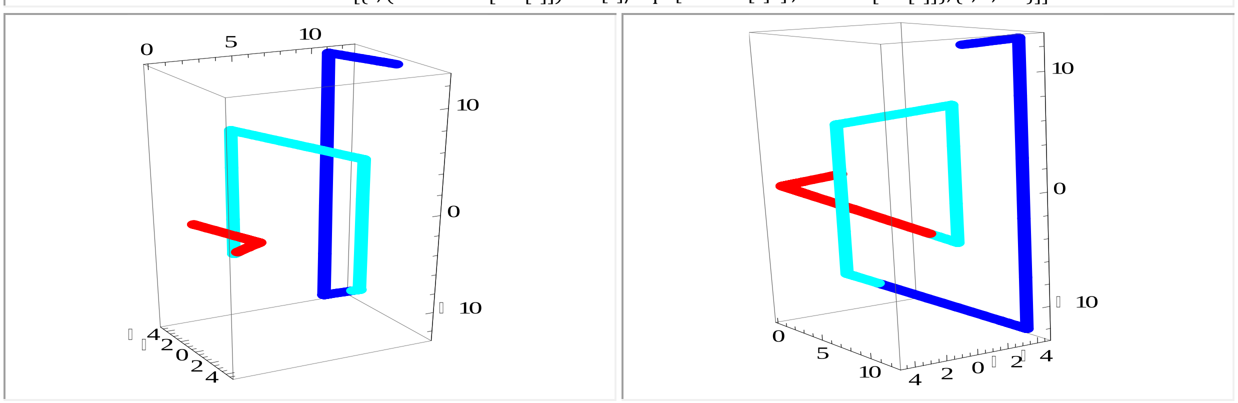
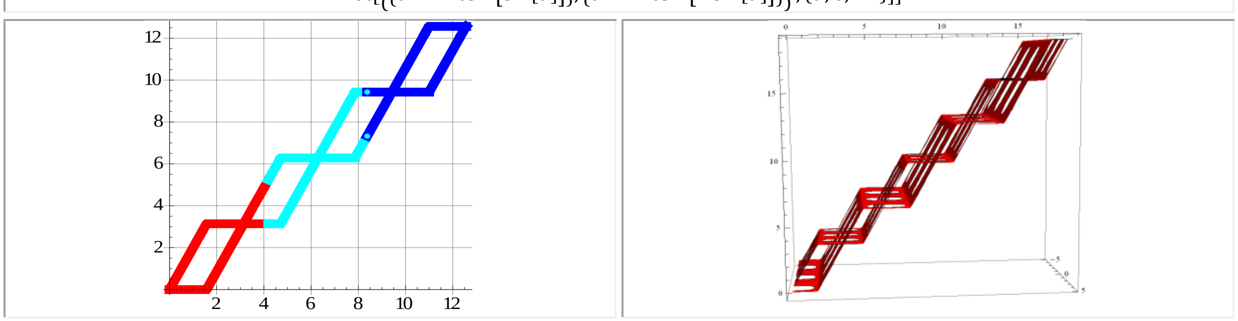


Fig. 3 The Smarandache flat curves from Figure 1 in 3D, two views

Plot[{{θ − ArcSin[Sin[θ]]}, {θ − ArcSin[−Sin[θ]]}}, {θ, 0,4Pi}]]



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ParametricPlot3D[{{θ, θ − ArcSin[Sin[θ]], 2ArcSin[Sin[θ]]}, {θ, θ − ArcSin[−Sin[θ]], 2ArcSin[Sin[θ]]}}, {θ, 0,4Pi}]
```

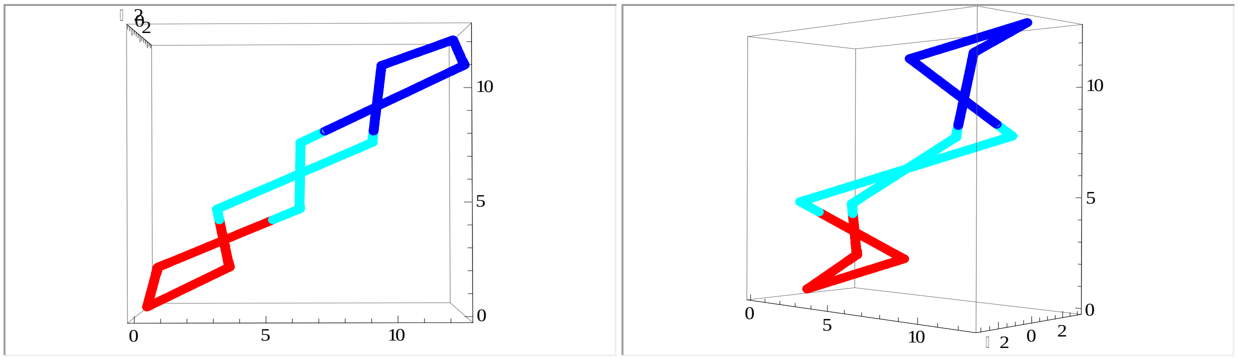

Fig. 4 Smarandache flat functions ▲ and in 3D ▼, two views

ParametricPlot[{t, t − ArcSin[Sin[t]] ∗ Cos[t]/Sqrt[1 − Sin[t]]}, {t, 0,6Pi}]] → Funcţia în trepte **Smarandache** plană

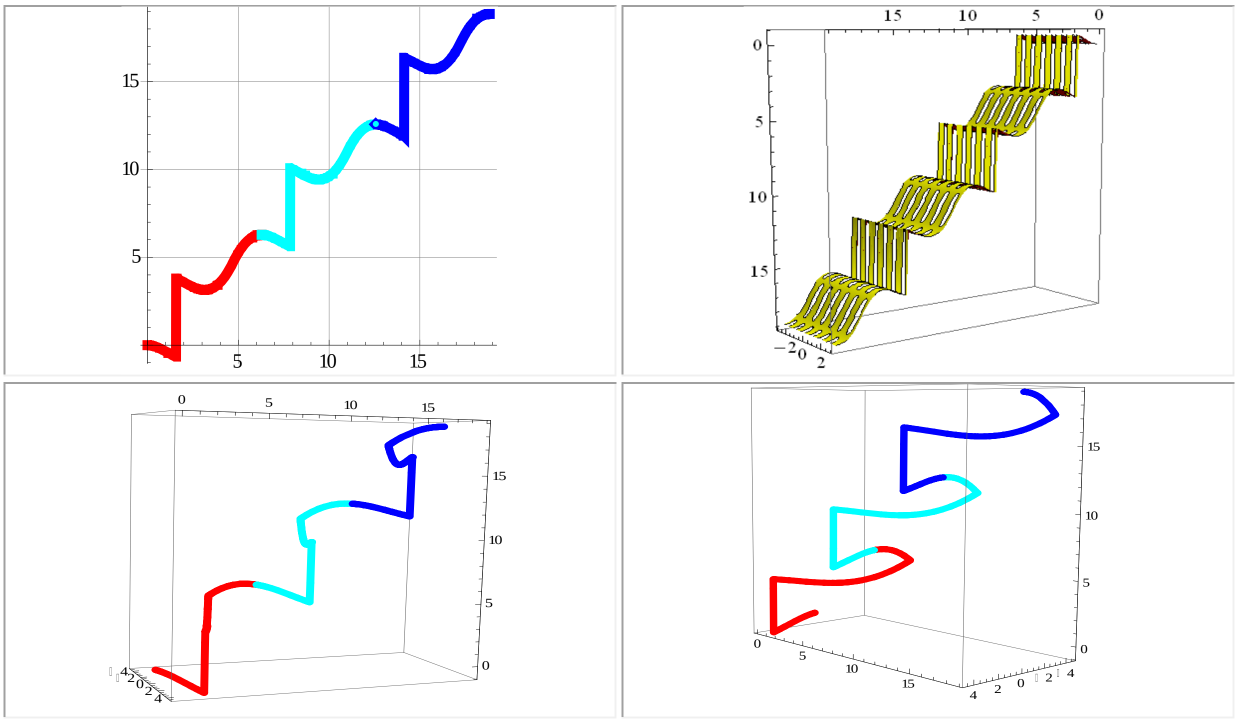

Fig. 5,a Smarandache flat functions in steps ▲ transformed with bexθ in 3D ▼

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ParametricPlot3D[{t, t − ArcSin[Sin[t]] ∗ Cos[t]/Sqrt[1 − Sin[t]], 3Cos[t − ArcSin[Sin[t]]]}, {t, 0,6Pi}]]
```

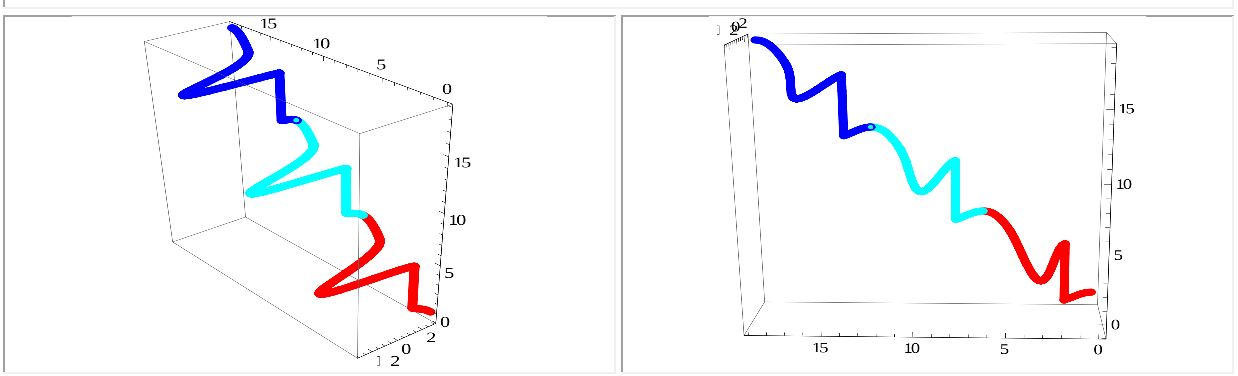


Fig. 5,b Smarandache flat functions in steps ▲ transformed with cexθ in 3D ▼

ParametricPlot3D[{t, t − ArcSin[Sin[t]] ∗ Cos[t]/Sqrt[1 − Sin[t]] , 3Sin[t − ArcSin[Sin[t]]]}, {t, 0,6Pi}

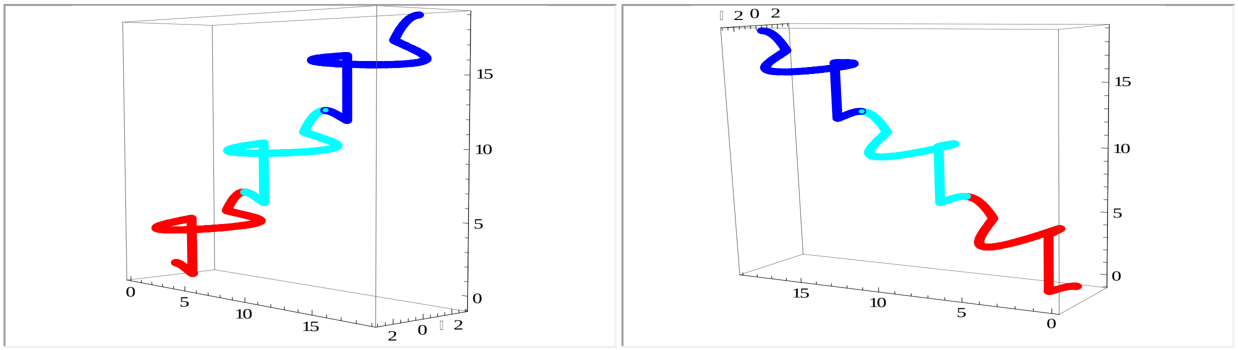


Fig. 5,c Smarandache flat functions in steps ▲ transformed with sexθ in 3D ▼

If, when expressing the functions of the excentric amplitude (2), one considers **n.bexθ** and **nBexα** then the Smarandache functions in steps modifies their form as in **figure 6**.

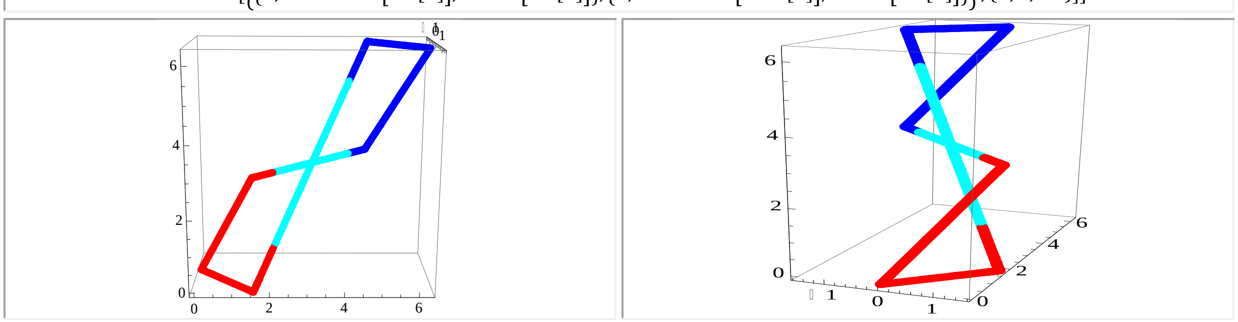
n = 1

n = 2

n = 3

Fig. 6 Smarandache flat functions with n.bexθ ◀ and n.Bexα ▶ , n = 1, 2, 3

ParametricPlot3D[{{θ, θ − ArcSin[Sin[θ]], ArcSin[Sin[θ]]}, {θ, θ − ArcSin[−Sin[θ]], ArcSin[Sin[θ]]}}, {θ, 0,2Pi}] → **n = 1**



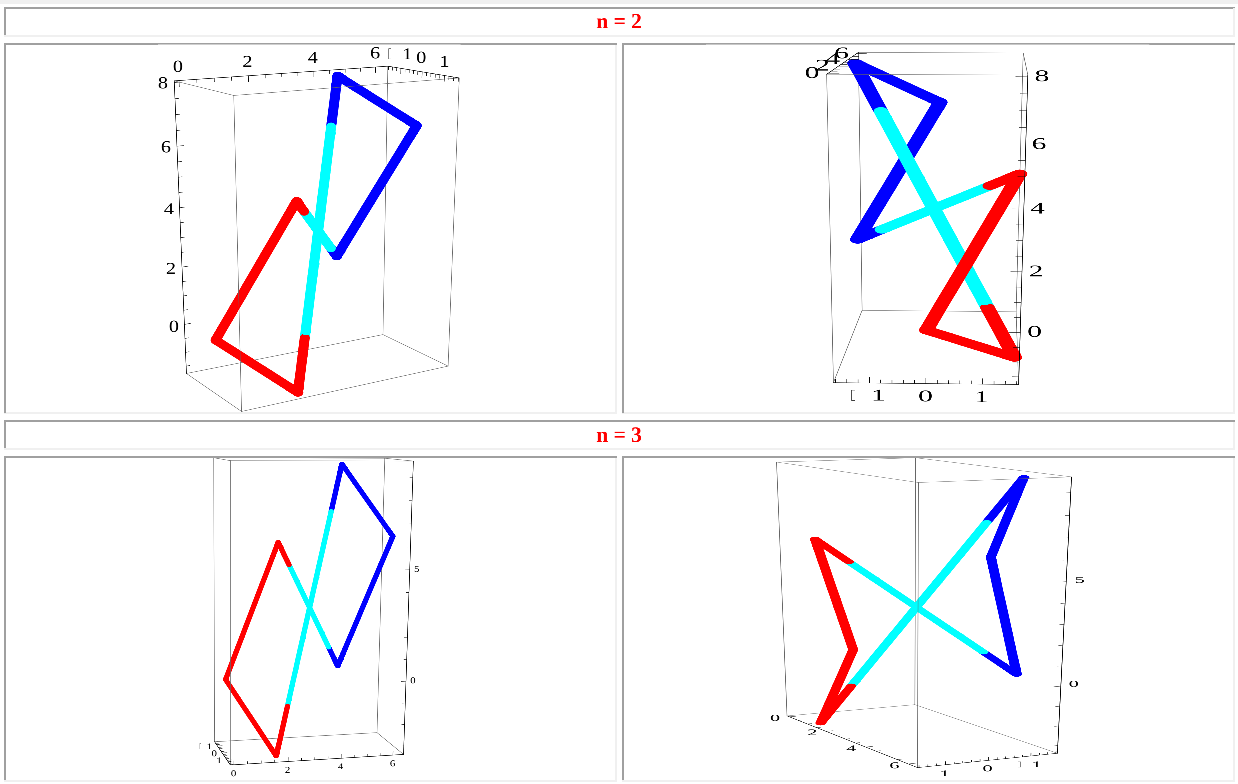


Fig. 7 Smarandache flat functions, from figure 6, transformed in Sm 3D functions

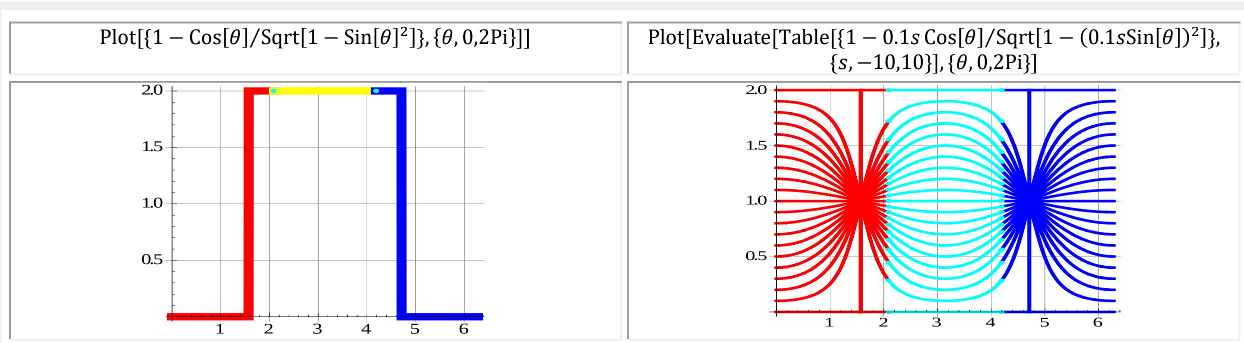
2. OTHER SUPERMATHEMATICAL EXCENTRIC CIRCULAR FUNCTIONS TRANSFORMED FROM 2D IN 3D

1. SUPERMATHEMATICAL RECTANGULAR SIGNAL

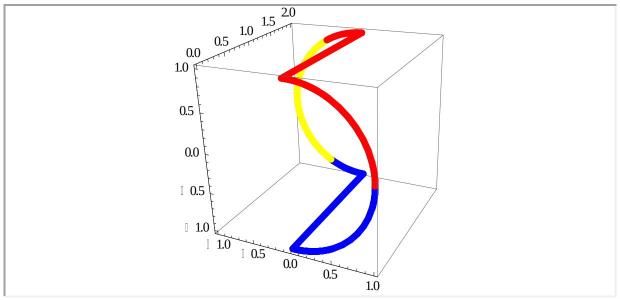
The shape of the rectangular signal or of the ***supermathematical excentric circular function*** (**SMF—EC**) ***rectangular*** represented in **figure 8** ▲◀ is a derived **SM** excentric function **dexθ** ▲▶ of linear numerical excentricity **s = ± 1**.

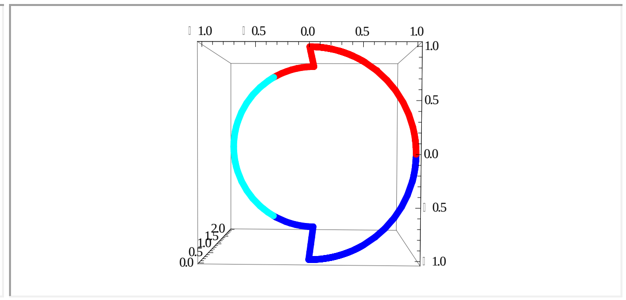
If in the parametric equations from **3D** we add the parametric equations of a circle of radius R = 1 to the rectangular signal equation, then the **2D** flat curve transforms in a **3D** curve **Fig. 8** ▼◀ which seen from a certain direction projects in a unity-circle **Fig. 1** ▼▶, and if the circle is (seems) discontinuous, this is due to it is due to the perspective.

Depending on the position of the equation of the rectangular function the circle will be parallel to one of the three planes, as can be seen in **figure 8** ▼▼.



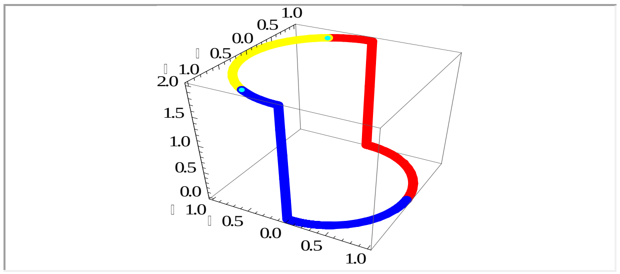
ParametricPlot3D[{Cos[θ],1 − Cos[θ]/Sqrt[1 − Sin[θ]^2], Sin[θ]}, {θ, 0,2Pi}]





ParametricPlot3D[{Cos[θ], Sin[θ], 1 − Cos[θ]/Sqrt[1 − Sin[θ]^2]}, {θ, 0,2Pi}]

ParametricPlot3D[{1 − Cos[θ]/Sqrt[1 − Sin[θ]^2], Cos[θ], Sin[θ]}, {θ, 0,2Pi}]



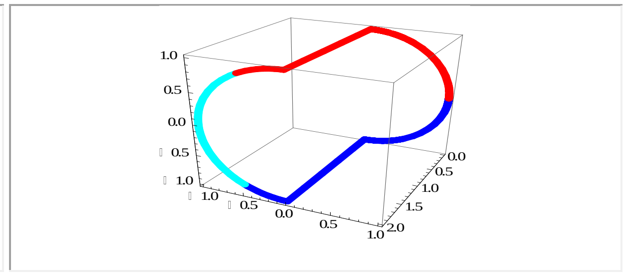
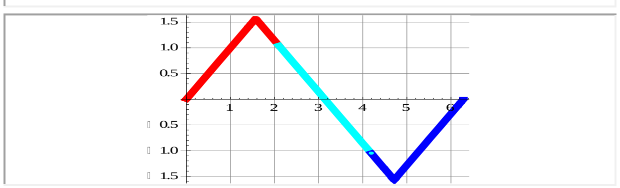


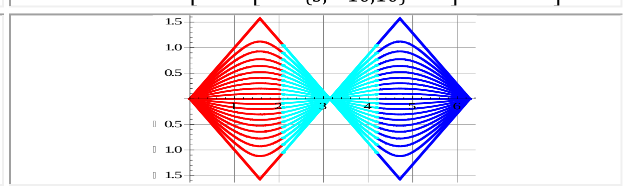
Fig. 8 SM Rectangular Signal in 3D

If the central circular functions (**CCF**) **cosθ** and **sinθ** are replaced by the arcs of these functions, i.e. with **arcsin[cosθ]** and, respectively, **arcsin[sinθ]**, one obtains the **3D** functions of the supermathematical (SM) triangular signal.

Plot[{ArcSin[Sin[θ]]}, {θ, 0,2Pi}]

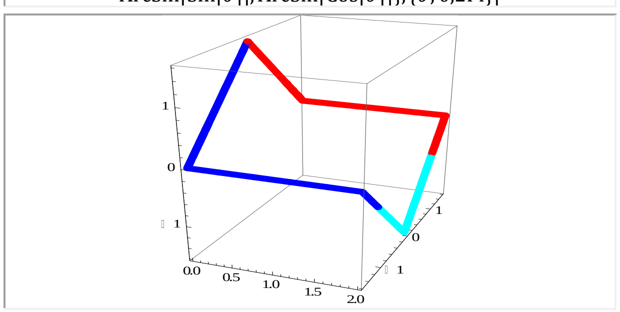
Plot[Evaluate[Table[{ArcSin[0.1sSin[θ]]}, {s, −10,10}], {θ, 0,2Pi}]]

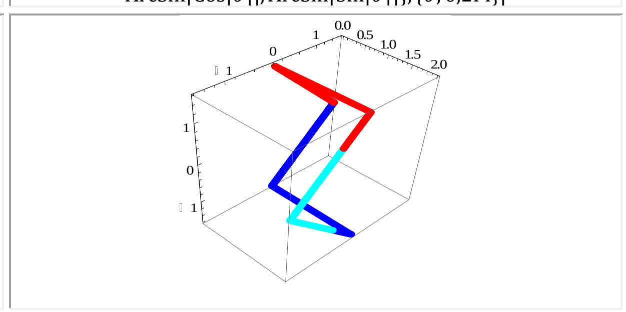




ParametricPlot3D[{1 − Cos[θ]/Sqrt[1 − Sin[θ]^2], ArcSin[Sin[θ]], ArcSin[Cos[θ]]}, {θ, 0,2Pi}]

ParametricPlot3D[{1 − Cos[θ]/Sqrt[1 − Sin[θ]^2], ArcSin[Cos[θ]], ArcSin[Sin[θ]]}, {θ, 0,2Pi}]





ParametricPlot3D[{ArcSin[Sin[θ]], − Cos[θ]/Sqrt[1 − Sin[θ]^2], ArcSin[Cos[θ]]}, {θ, 0,2Pi}]

ParametricPlot3D[{ArcSin[Cos[θ]], ArcSin[Sin[θ]], 1 − Cos[θ]/Sqrt[1 − Sin[θ]^2]}, {θ, 0,2Pi}]

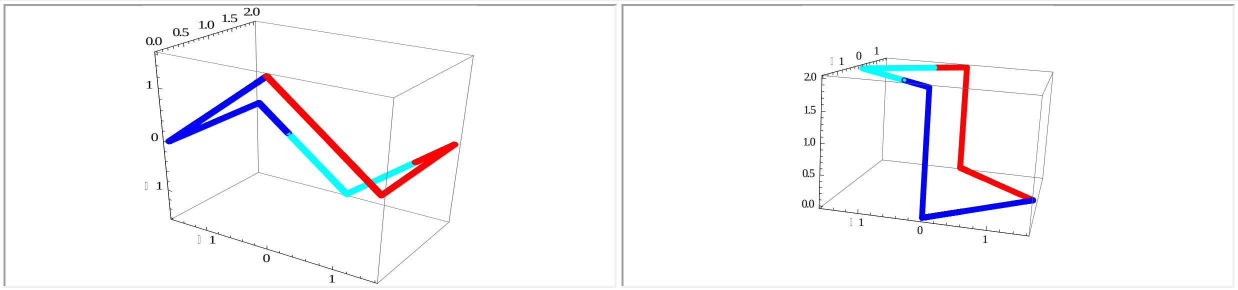


Fig. 8 SM Triangular Signal in 3D

Timisoara, September 2021