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The mathematical metaphor of analysis

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Abstract

The present article deals with the points of connections between the Jungian concept of transcendent function compared to the mathematical function.

Through the study of a function, it can be represented a complex system, such as conscious and unconscious, fantasy and chaos, images and numbers, continuity and discontinuity. In other words, the study demonstrates a possible overlapping between Maths and Analytic Psychology, not just linguistic, but also structural, between these disciplines, both product of the human mind.

Key words: Trascendent Function, Mathematical Metaphor, Analytical Psychology.

Introduction

The word analysis can assume many meanings in different contexts: in particular I will try to deepen the meaning that this word assumes in mathematics and in analytical psychology.

Mathematical language has many terms in common with the language of analytic psychology: many of them can be used to describe many psychic processes. Is it just a linguistic analogy?

I refer, in particular, to the terms used in mathematical analysis: mathematical analysis is a branch of mathematics based on the principles of infinitesimal calculus. The infinitesimal calculus introduces the concepts of infinity and limit, continuity and discontinuity.

Mathematics is, perhaps, the most powerful and complex symbolic language that humanity has developed: a universal, rigorous, synthetic and predictive language but also an abstract and very complex language, commonly seen as something very difficult to understand!

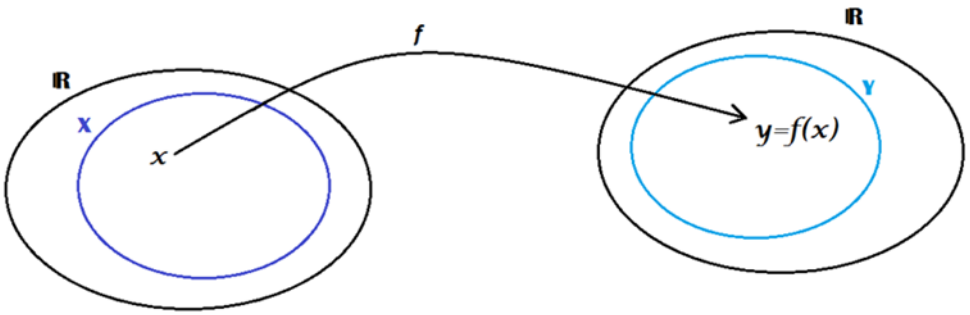
However, there are many terms that are borrowed from math and we can found in the language of other disciplines or in the common language.

Jung, for example, used the term "function" and in particular "transcendent function" to refer to the dynamic relationship between conscious and unconscious contents: "*By the name of transcendent function we must not mean nothing of mysterious, super-sensorial or metaphysical, just saying, but a psychological function that - given its nature - can be compared to a mathematical function that has the same name and is a function of imaginary and real numbers. The transcendental psychological function results from the unification of conscious and unconscious contents."* (Jung C.G., 1957/58)

It’s interesting to deepen the concept of transcendent function and Jung's definition, even from a mathematical point of view.

In order to understand what a transcendent function is, we must begin with some simple concepts of mathematical analysis, as function’s definition, and some of its particular properties.

What is a function? In very elementary terms, it’s a law that corresponds to an element of a set X the element of another set Y.



What does mean "to study a function?"

It basically means to be able to draw its graph, to study its trend, from which valuable information can be obtained.

Today math tries to study and represent complex systems, which cannot be represented by a single function, but with more complex tools related to the theories of chaos and fractals.

A fractal is an object with a complex subtly branched structure; gradually enlarging part of the structure gives up light details that repeat identical to all growth scales. A fractal thus appears to be always similar to itself if you look at it at a large, small or very small scale.

Another peculiarity of fractals is that they do not express themselves through primary forms, but by algorithms, that is to say, a set of mathematical procedures that are translated into geometric shapes with the aid of a computer. This creates a great deal of geometric shapes from a rather simple algorithm. Scale invariance finds remarkable parallelism in the theory of chaos, in which many phenomena, though rigid deterministic rules follow, are unpredictable in principle. Chaotic events, such as atmospheric turbulence or heart pulses, show similar trends in different time scales, more or less as self-similar objects exhibit similar structural shapes on different spatial scales. Some scientists are looking for fractal structures even in the Rorschach's test. Surely the mathematical approach to the study of a phenomenon leads to a more or less complex graphic representation.

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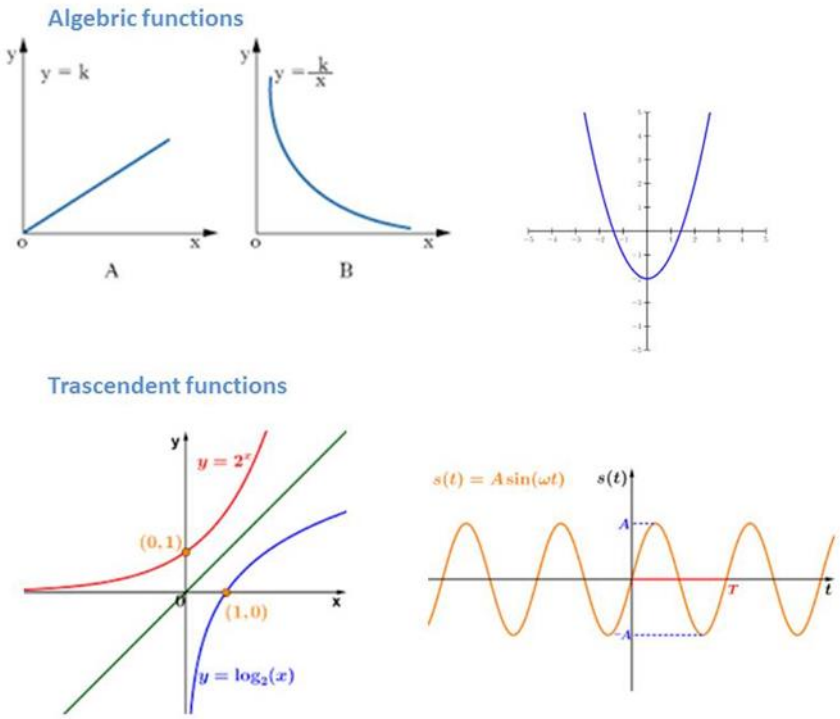
The graphic representation of a phenomenon is based on its mathematical law and can give us "an image" of it. The image helps understanding, our mind works by imagery: every thought manifests itself first as an image, each word accompanies a real or fantastic image that it is.

The idea of infinity, for example, is so difficult to grasp because we don't have an image of infinity. The infinity is not an image and therefore becomes difficult to understand.

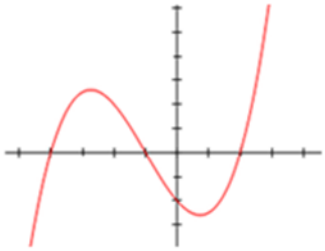
To represent graphically a function, use the Cartesian plane, defined by the x (horizontal) axis and the y (vertical) axis, that meet at point O, the origin.

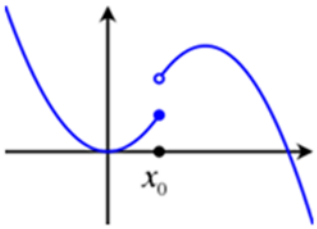
There are many types of function: the linear function representing the direct proportionality between the magnitudes (increasing one increases the other); the parabola representing quadratic proportionality, the hyperbola representing the inverse proportionality (when one decreases one decreases because the product is constant). Goniometric functions represent periodic phenomena, exponential and logarithmic functions are another types of functions.



The goniometric, exponential and logarithmic functions are commonly called TRASCENDENT, because they are not algebraic.

The first thing you can notice in a function's graph is that it is only partially represented, we cannot draw an infinite line or curve (the sheet will still be over) and with a continuous sign. Sometimes there may be interruptions (of discontinuities or jumps).





Since we cannot represent a function infinitely, we must try to perceive its behavior when x takes on larger and smaller values, that is, we must calculate the limits of the function.

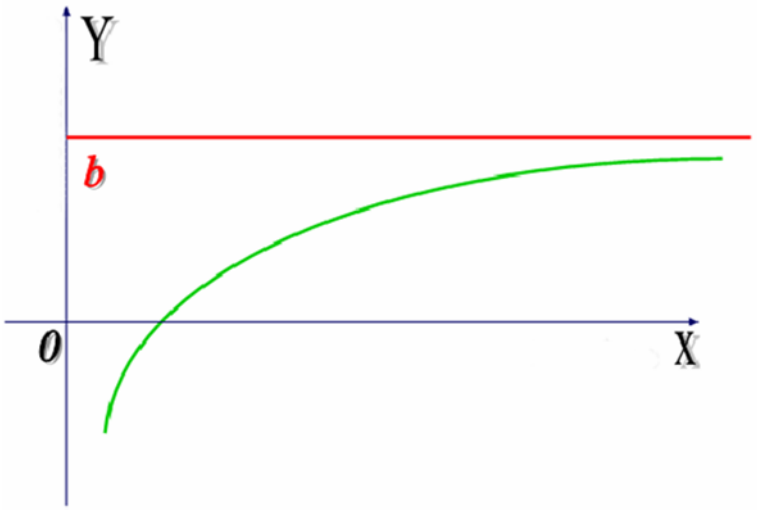
The function graph may tend to a well-defined value or tend to ever larger (more infinity) or smaller (less infinity) values.

It is very important to study the behavior of the function at the extremes of its definition set, namely calculating the limits of the function.

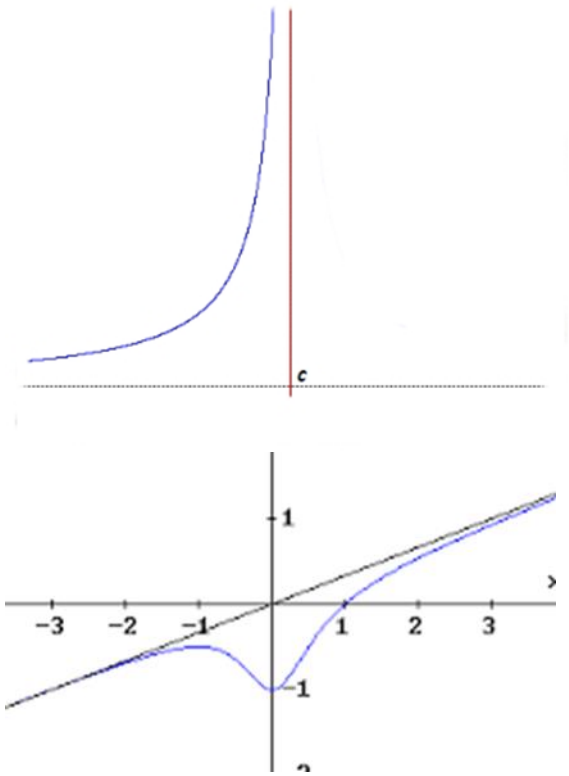
It’s interesting to note the analogies between some mathematical definitions and the characteristics that Jung attributes to the behavior of consciousness towards the unconscious.

I’ll try to translate, with mathematical images, the definitions and properties that Jung attributes in his essay to the transcendent function.

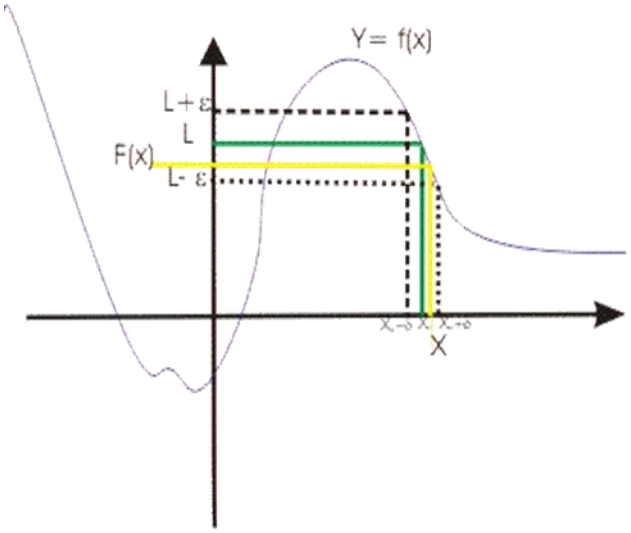
1) The contents of the unconscious have a limit value so that all the elements too weak remain in the unconscious.



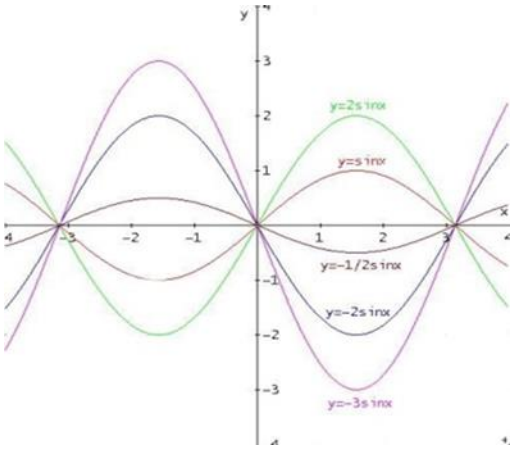
2) Consciousness, through its "directed" functions, exerts an inhibition on all unsuitable material, because of which this unsuitable material falls into the unconscious.



3) Consciousness forms the "momentary adaptation process", while the unconscious contains all the forgotten material of the individual past and all the hereditary, structural traits of functions of the human spirit in general.

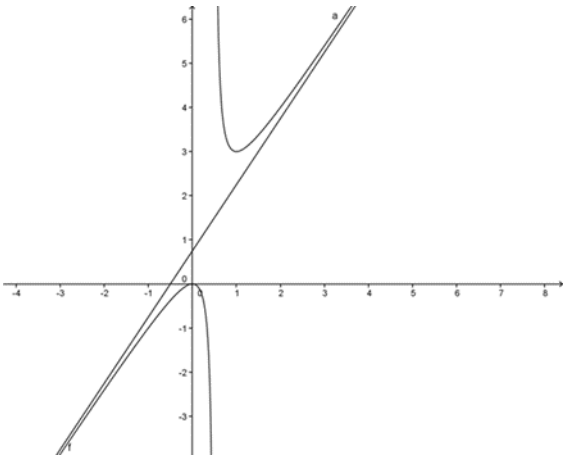


4) The unconscious contains all the combinations of fantasy that have not yet crossed the threshold and that with the passing of time, under appropriate circumstances, will emerge in the light of consciousness.

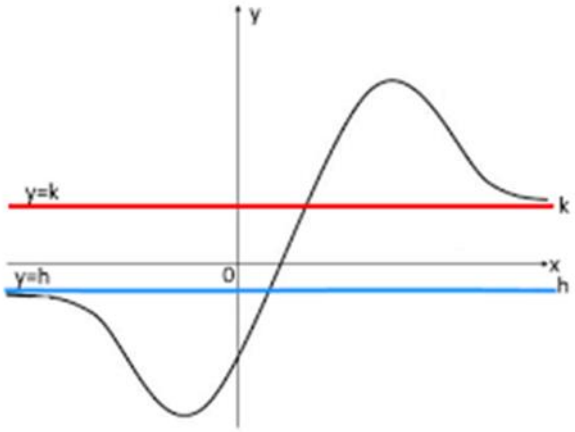


Returning to the graph of a function, we can say that when a function's graph moves close a straight line, we define this straight "*asymptote*": the straight line and curve will never meet, except for infinity.

We can say that many processes are asymptotic: every time we approach the comprehension of a phenomenon without taking it into its essence, each time we use a symbol without exhausting all possible meanings we implement an asymptotic procedure.



If we try to explore the structure of the psyche, we realize a process that takes place for models and approximations, as in the physical world. In this process of knowledge by degrees, the picture approaches the essence of the psyche much more than the word itself, but always "asymptotic".



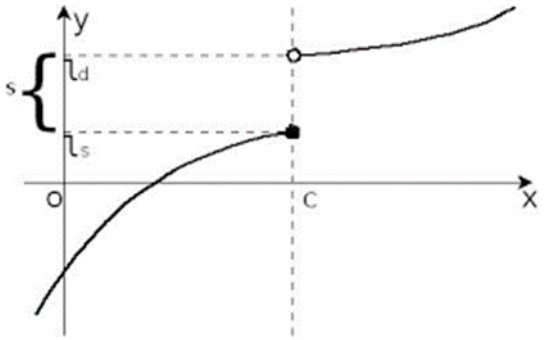
Can we not talk about continuity, discontinuities, and limitations for the psyche?

Is not the disease a discontinuity? Is not the neurosis a kind of wound or tear?

The discontinuity is the anomaly, the pen that comes off the sheet, the line that interrupts, the "jump" in the chart.

Jung speaks of discontinuity between consciousness and dream "*dream does not arise from a clearly identifiable logical and emotional continuity of existence, but is a residual of a psychic activity of particular nature that occurs during sleep. "* (Jung, 1957/58, p. 225).

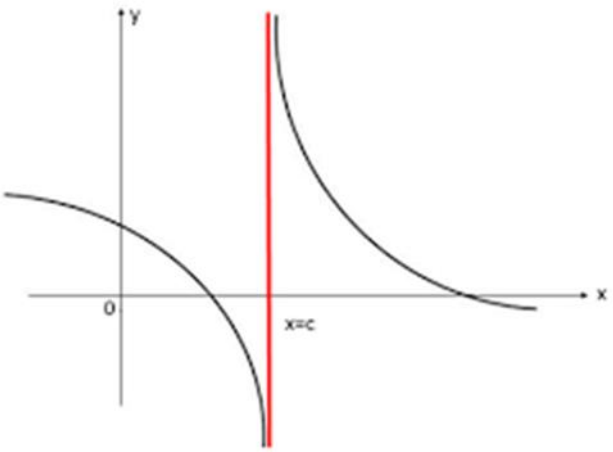
In mathematics it would be a first-rate discontinuity that creates a jump in the graph, because the function from right to left does not converge to the same point. By analyzing dreams we can reduce this "jump" or make it measurable anyway.



Discontinuity is the self-discourse that is interrupted, the event that cannot be accepted, the pain that breaks out, the irrational that breaks and makes us vacillate.

Discontinuity leads us to the limit, to the search for the extreme, to the infinite tension, to something that we can never arrive but to which we complain.

In mathematics it would be a point of discontinuity of the second type, which is when the function at the point where we study it, has no defined value but admits an infinite limit.



Taking contact with their unconscious content allows the expansion of consciousness itself, it is a constant but endless approach process that cannot give a definite outcome, as the symbol that, if understood in its meanings, is snapped in the mark.

Symbols always point to something else, in a process of tension to infinity.

The infinite, a symbol, precisely.

The limit challenge is the search for the last border, which can be the boundary and limit of our body (in eating disorders or in automutilation practices), the limit in violent relationships that lead to murder (often of woman, physically part And psychologically weaker and passive), the limit of risk behaviors (in dependencies) leading to death.

The limit is the tension over or over.

A function approaches a line in an "asymptotic" manner, which means that the function and line graph will approach more and more without ever touching, will meet "infinitely".

After all, does not we approach the nucleus of the complexes in the same way? Psyche's knowledge is an asymptotic process: we cannot know the archetypes but the archetypal images, we can approach the essence but do not reach it, the noumenon as something in itself, it is impossible to grasp.

Let's return to the transcendent function

Jung cites the mathematical definition of transcendental function: a function of imaginary and real numbers and captures, not mathematically, a mathematical subtlety.

Mathematical analysis deals with functions that have the domain and coding the real numbers.

The pure imaginary numbers are basically the index roots equal to a negative number, impossible operation in the set of real numbers.

A real number and a pure imaginary number form what is called a complex number.

A complex number can be expressed in algebraic form:

$$z=a+ib$$

or in a trigonometric form:

$$z = r\,(\cos\theta + i\,\mathrm{sen}\theta)$$

There is also the exponential form:

$$e^{i\theta} = \cos\theta + i\,\mathrm{sen}\theta$$

The complexes contain a real and an imaginary part.

And does not it seem like a phrase suitable to describe the Jungian model of the psyche?

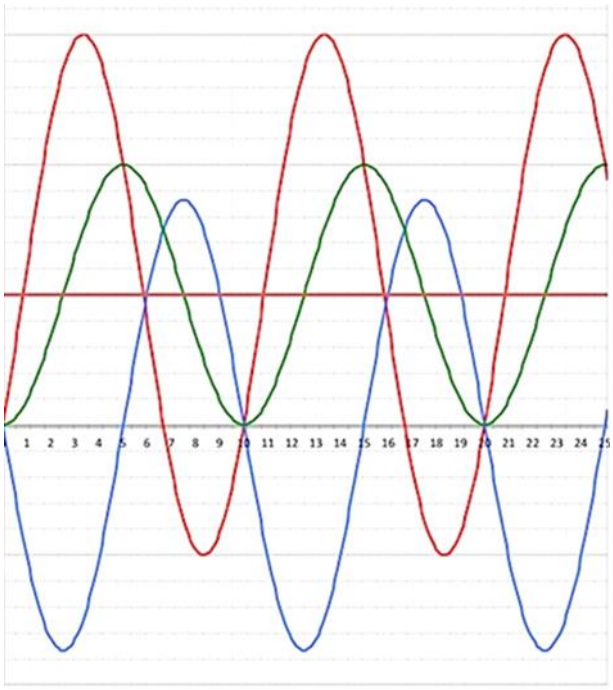
The complex belongs to the personal unconscious and we know that through analysis we can look for ways to get in touch with the contents of the unconscious. Various complexes are simultaneously in action, with more or less intense energy.

The energy of the complex allows the complex itself to access the level of consciousness even if not always in an understandable form. If we wanted to find a graphic form, we could imagine periodically distributed functions.

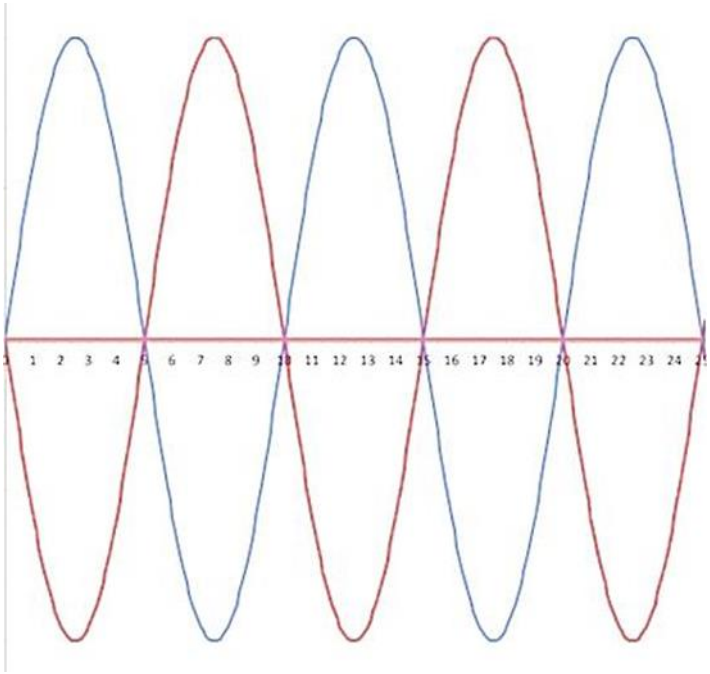
The equation of one of these curves could express itself as:

$$E = E_0\,(\cos\varphi + i\,\mathrm{sen}\varphi) = E_0 e^{i\varphi}$$

And this is a TRANSCENDENT FUNCTION!



The conscious attitude of the 'common mortal', when it is not directed in excessive form, can be permeated in a soft and therefore acceptable way by unconscious elements that can spontaneously find the way and the way to emerge. Thus the balance between conscious and unconscious would be maintained thanks to these frequent but discrete small invasions by the most instinctive components, by virtue of the self-regulating mechanism of the psyche.



The transcendent function is not an automatic fact, but requires some process and certain factors, some of which - as the same mathematical function - are initially unknown. In many cases, the patient has no way or means to keep an eye on what is happening in him. At this point the doctor must intervene, applying a particular treatment method...."The analysis "!

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