A Few Things You Need to Know to Tell if a Mathematical Physicist is Talking Nonsense: the Black Hole - a Case Study

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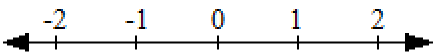
FOREWORD

Cosmologists claim that they have found black holes all over the Cosmos. The black hole is however entirely a product of mathematics. The simplest case is the 'Schwarzschild' black hole, from the solution to Einstein's field equations in the absence of matter, for a static, uncharged, non-rotating mass. "In the absence of matter" involves linguistic legerdemain, but in any event all types of black holes reduce, mathematically speaking, to a very simple question: Can a squared real number take values less than zero? Symbolically this is restated as follows. Let r be any real number. Is $r^2 < 0$ possible? No, it's not possible. Thus, the black hole is not possible. Anybody who can square a real number is capable of understanding why the black hole is a fantasy of mathematical physicists and cosmologists, illustrating once again why it can be very dangerous to put trust in the word of an Authority.

1. The Real Number Line

Here is the real number line.



The arrows indicate that the number line is limitless (i.e. infinite) in each direction. The numbers on the line are said to be *ordered* in that moving to the right the numbers always get bigger, moving to the left they always get lesser. This involves direction and so the number line is also said to be *directed*. Any number on the number line can be chosen as a reckoning point, but 0 is common.

The distance between any two different numbers on the number line is determined by subtracting the lesser number from the greater number. For example, let n and m be numbers on the real number line and let $n > m$. Then the distance between n and m is $(n - m)$. Distance between any two places is never less than zero, and so, in general, $(n - m) \geq 0$. Therefore, if $n = m$, the distance is always 0.

Given any two numbers on the number line the distance between them can be written using the absolute value symbols | | and writing the difference between numbers without regard to their position on the number line. For example, let p and q be any real numbers. The distance between them on the number line is then $|p - q|$, which is to be read as follows: $(p - q)$ if $p > q$, or as $-(p - q)$ if $p < q$. Of course, if $p = q$ then $|p - q| = 0$. In any event, $|p - q| \geq 0$; and so $|p - q| < 0$ is impossible.

2. The Square of a Real Number

Let r be any real number. Then r^2 is a real number and $r^2 \geq 0$. For example, if $r = -2$ then $r^2 = 4$; if $r = 0$ then $r^2 = 0$; if $r = 3$ then $r^2 = 9$. Thus the square of any real number can never be less than zero.

3. The 'Schwarzschild Solution'

First consider Droste's solution [1]:

$$ds^2 = \left(1-\frac{\alpha}{r}\right)dt^2 - \frac{dr^2}{\left(1-\frac{\alpha}{r}\right)} - r^2\left(d\theta^2 + \sin^2\theta\, d\varphi^2\right)$$

$$\alpha \le r \qquad (1)$$

Here α is a non-negative constant. To obtain the so-called 'Schwarzschild solution' from Droste's solution the mathematical physicists and the cosmologists set $\alpha = 2Gm/c^2$. Then they set $G = 1$ and $c = 1$ so that $\alpha = 2m$. Finally they assert that $0 \le r$. The result is,

$$ds^2 = \left(1-\frac{2m}{r}\right)dt^2 - \frac{dr^2}{\left(1-\frac{2m}{r}\right)} - r^2\left(d\theta^2 + \sin^2\theta\, d\varphi^2\right)$$

$$0 \le r \qquad (2)$$

They call this 'Schwarzschild's solution', or the 'extension' of Schwarzschild's solution, but it isn't Schwarzschild's actual solution either way [2]. The expressions (2) are in fact Hilbert's solution [3], and it is from them that the black hole was first conjured.

3. An Equivalence Class

An equivalence class is just a collection of things that are in fact the same thing, just in different terms. Each element of such a collection describes the very same thing, but superficially looks different to the other elements. For example, the equation of a circle of radius r in Cartesian coordinates, centred at the origin (0, 0) of the coordinate system is,

$$x^2 + y^2 = r^2$$

This circle can be moved to any other centre at coordinates (x_0, y_0) and the equation of the circle becomes,

$$(x - x_0)^2 + (y - y_0)^2 = r^2 \qquad (3)$$

The geometry of the circle has not changed by moving it; it has the same radius, and hence the same area, the same circumference, etc. All circles (3) are congruent. Congruence is an equivalence relation. There is no limit to the different values that can be assigned to x_0 and y_0. Collecting together all these equations for the same circle yields an equivalence class, since every such equation is equivalent to every other. Because there is no limit to the ways in which values can be assigned to x_0 and y_0, the collection of all such equations is an infinite or limitless equivalence class. The infinite equivalence class for the circle is generated by assigning arbitrary values to x_0 and y_0 in equation (3). So equation (3) is the generator or ground-form of the equivalence class for the circle.

4. The Schwarzschild Equivalence Class

Droste's solution is equivalent to Schwarzschild's actual solution. The equivalence class containing their solutions is an infinite equivalence class. What then is the generator or ground-form for this equivalence class? Here[1] it is [3, 4],

$$ds^2 = \left(1-\frac{\alpha}{R_c}\right)dt^2 - \frac{dR_c^2}{\left(1-\frac{\alpha}{R_c}\right)} - R_c^2\left(d\theta^2 + \sin^2\theta\, d\varphi^2\right)$$

$$R_c = \left(\left|r - r_0\right|^n + \alpha^n\right)^{1/n} \qquad (4)$$

[1] $|r - r_0|^2$ is the square of a real number.

wherein r_0 is an arbitrary real constant and n is an arbitrary positive real constant. Setting $r_0 = 0$, $r_0 \leq r$, and $n = 3$, produces Schwarzschild's actual solution [2]. Setting $r_0 = \alpha$, $r_0 \leq r$, and $n = 1$, produces Droste's solution (1). Now if Droste's solution can be extended to Hilbert's $0 \leq r$ (equation (2) above), in order to make a black hole, as alleged by the mathematical physicists and the cosmologists, then not only must Schwarzschild's actual solution also be extendible to $-\alpha \leq r$ to make a black hole, every equation in the equivalence class must be extendible to make a black hole in the corresponding way, on account of equivalence. Such 'black hole' extensions must produce $0 \leq R_c$ in all cases, owing to equivalence. Conversely, if no element of the equivalence class can be extended to make a black hole then none can be extended to make a black hole, on account of equivalence. But $|r - r_0|$ can never have values less than zero, and so R_c in (4) can never have values less than α. Consequently no solution generated by expressions (4) can be extended to the range $0 \leq R_c$. To amplify this, set $r_0 = 0$ and $n = 2$. Then from expressions (4),

$$R_c = \left(r^2 + \alpha^2\right)^{1/2} \qquad (5)$$

because $|r|^2 = r^2$. Thus R_c can never be zero since $r^2 \geq 0$. In fact R_c can never be less than α. In equation (5) above, the black hole requires that $-\alpha^2 \leq r^2 < 0$. In other words, the black hole requires that the square of a real number must take values less than zero. This is impossible. Hence, this solution cannot be extended. Consequently no solution generated from the ground-form (4) can be extended, and so Droste's solution cannot be extended to get Hilbert's solution. Therefore, the black hole is impossible – Hilbert's solution is not equivalent to Schwarzschild's; consequently Hilbert's solution is invalid.

5. The Lesson Learned

Black holes are the product of mathematical fallacies. Just because mathematicians, physicists and cosmologists do long sums does not mean that they make sense or that their mathematics is even right. Mathematical mumbo-jumbo cannot be observed floating about in the Cosmos, devouring stars and nebulae, or 'spaghettifying' intrepid astronauts boldly going where no man has gone before, despite the claims of cosmologists [5]. It is by wishful thinking that observations by cosmologists of what they don't understand are made to conform to the mathematical fallacies of the black hole.

Note: This article is the third in a series [6, 7].

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