Error In Einstein's Calculation Of Perihelion For Mercury

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Abstract

An error in Albert Einstein's paper, "Erklrung Perihelbewegung des Merkur aus", invalidated his confirmation of the precession of perihelion for Mercury. Einstein made an assumption on an equation to calculate the angle of precession. Unknown to Einstein, the assumption caused two roots of this equation to become imaginary numbers.

I. INTRODUCTION

In 2013, Hua Di[1] noticed an error in Albert Einstein's paper[2]: "Erklrung Perihelbewegung des Merkur aus". Di pointed out that Einstein had incorrectly calculated the integration. The actual angle from the integration should be 71 instead of 43 as Einstein had obtained. In 2017, Di's calculation was verified by N. V. Kupryaev[3].

Unknown to both Di and Kupryaev, there is another error in Einstein's integration equation more serious than the integration error. Einstein made an assumption in order to obtain three roots for the equation used for integration. The assumption is incorrect. There is no need for Di to verify Einstein's error at all because two of the roots are imaginary numbers.

II. PROOF

A. Integration

Equation (11) in Einstein's paper is reproduced as

$$(\frac{dx}{d\phi})^2 = \frac{2A}{B^2} + \frac{\alpha}{B^2}x - x^2 + \alpha x^3 \tag{1}$$

Einstein stated: "That contribution from the radius vector and described angle between the perihelion and the aphelion is obtained from the elliptical integral."

$$\phi = \int_{\alpha_1}^{\alpha_2} \frac{dx}{\sqrt{\frac{2A}{B^2} + \frac{\alpha}{B^2}x - x^2 + \alpha x^3}} \tag{2}$$

"where α_1 and α_2 are the corresponding first roots of the equation"

$$\frac{2A}{B^2} + \frac{\alpha}{B^2}x - x^2 + \alpha x^3 = 0 \tag{3}$$

"Hereby we can with reasonable accuracy replace it with"

$$\phi = (1 + \frac{\alpha}{2}(\alpha_1 + \alpha_2)) \int_{\alpha_1}^{\alpha_2} \frac{dx}{\sqrt{-(x-\alpha_1)(x-\alpha_2)(1-\alpha x)}} \tag{4}$$

With this equation, Einstein claimed to confirm the motion of Mercury. However, unknown to Einstein, there is a serious error hidden in equation (4).

B. Mathematical Error

Equation (3) can be reformulated as

$$\frac{2A+1}{B^2} - \frac{1}{B^2} + \frac{\alpha}{B^2}x - x^2 + \alpha x^3 = 0 \tag{5}$$

and factorized as

$$\frac{2A+1}{B^2} - (\frac{1}{B^2} + x^2)(1 - x\alpha) = 0 \tag{6}$$

From equations (2,4), Einstein assumed equations (7)

$$\frac{2A}{B^2} + \frac{\alpha}{B^2} - x^2 + \alpha x^3 = 0 \tag{7}$$

shares the same roots with equation (8)

$$-(x-\alpha_1)(x-\alpha_2)(1-\alpha x) = 0 \tag{8}$$

However, if one root is

$$1 - x\alpha = 0 \tag{9}$$

then from equation (6)

$$\frac{2A+1}{B^2} = 0 \tag{10}$$

From equation (6,10),

$$-(\frac{1}{B^2} + x^2)(1 - x\alpha) = 0 \tag{11}$$

From equations (8,11),

$$\alpha_1 = \frac{\sqrt{-1}}{B} = -\alpha_2 \tag{12}$$

Both α_1 and α_2 are imaginary numbers. The rest of the paper becomes invalid. Hence, Einstein's confirmation is also invalid.

III. CONCLUSION

The imaginary numbers in equation (11) of Einstein's paper renders the rest of the paper invalid. Unknown to Einstein, he was using imaginary numbers for calculation.

Einstein's incompetence in mathematics can be clearly illustrated by his research on gravitation. He begged for help from his classmate, Marcel Grossmann, as soon as he encountered Riemannian geometry. Einstein told Grossmann[5]: "You must help me, or else I'll go crazy.". After Grossmann stopped helping Einstein on the gravitation, Einstein made little progress until 1915 when he met David Hilbert who completed the theory of relativity for Einstein.

As Hilbert once remarked[5], "Every boy in the streets of Gottingen understands more about four-dimensional geometry than Einstein".

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[7] Eric Su: List of Publications, http://vixra.org/author/eric_su