Application Of Classical Algebra To Friedman Equations

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Abstract: The density of the universe determines the geometry and fate of the universe. According to Free dman's equations of general relativity published in 1922 and 1924, the geometry of the universe may be clo sed, open and flat. It all depends upon the curvature of the universe also. Various results of Cosmic Microw ave Background Radiation (CMBR), NASA's Wilkinson Microwave Anisotropy Probe (WMAP), and ESA 's Planck spacecraft probes found that our universe is flat within a margin of 0.4% error. In this short work, by applying the laws of quadratic equations, we attempt to show that OUR UNIVERSE IS FLAT.
[S. Kalimuthu **Application Of Classical Algebra To Friedman Equations***AcademArena*2021;13(4):76-77].ISSN1553-992X(print);ISSN2158-771X(online).http://www.sciencepub.net/academia.8. doi:10.7537/marsaaj130421.08.

Keywords: Cosmic background Radiation, Freedman Equation, Geometry of the Universe.

The density parameter Ω, the curvature parameter k and the Hubble parameter H are related as [7],

$$1-\Omega = -ke^2 H^2 R^2. \quad (1)$$

If omega is less than 1, k is −1. If omega is equal to 1, k is zero. If omega is greater than 1, k is +1.

If k is −1, the geometry of the universe is open, if it is greater than one, the shape of the universe is closed and the universe obeys Euclidean geometry if k is equal to zero.

Squaring (1),

$$1+\Omega^2 - 2\Omega - k^2c^4 H^4 R^4 = 0. \quad (2)$$

Equation (2) is quadratic in Ω.

The sum of the roots is given by

$$\alpha+\beta=-\frac{b}{a}. \quad (3)$$

The product of the roots is given by

$$\alpha\beta = c\ a = 1-k^2c^4 H^4 R^4. \quad (4)$$

Squaring (3),

$$\alpha^2+\beta^2+2\alpha\beta=4. \quad (3a)$$

Putting (4) in (3a),

$$\alpha^2+\beta^2+2-2k^2c^4 H^4 R^4 = 4,$$

i.e.,

$$\alpha^2+\beta^2-2k^2c^4 H^4 R^4 = 2. \quad (5)$$

Discussion

We have already seen that if Ω is less than 1, k is less than −1, if Ω is equal to 1, k is zero, and if Ω is greater than 1, k is +1.

in the same equation,	
we get that the equations satisfies.	(6)
Also, by assuming the roots are distinct in (3), and Ω is equal to 1,	
the equation again satisfies.	(6a)
By assuming Ω is greater than 1, and the roots are distinct,	
we get a contradiction in equation (3).	(7)
By assuming that the roots are distinct and Ω is less than 1,	
again we obtain a contradiction.	(8)
Conclusion	
A brief analysis of equation (7) reveals that our universe cannot be open.	(9)

Since equation (5) is a cosmological one, the roots must be distinct and positive. Assuming Ω is equal to on e, the curvature parameter is zero, the roots α and β are distinct and the value is +1. This satisfies equation (3). And when we assume $k = 0$,

Also ,a brief analysis of equation (8) reveals that our universe cannot be closed. (10)
So, the mere comparison of equations (3) and (6), (3), (6), (8) and (9), (10) establishes once and for all that our universe is FLAT [1-8].

References

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4/25/2021