

UFO Roswell
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November 23, 2009

Math 323 Students
University of Evansville
Evansville, IN 47722

Dear Math students,

I have recently encountered some difficulties as I am working to perfect the design of the Illudium Q-36 Explosive Space Modulator. The efficacy of the space modulator is directly related to the total mass of a planet's atmosphere; however, I have been unable to find a comprehensive almanac of planetary data that includes the mass of the atmosphere. My research has uncovered some information that I believe will allow the mass to be calculated. A spherical planet with radius R has an atmosphere whose density can be modeled by $\delta(h) = \delta_0 e^{-ch}$, where δ_0 is the density at sea level (or the planet's equivalent), h is the altitude above sea level, and c is a positive constant depending upon the make-up of the atmosphere.

I am particularly interested in finding the mass of the atmosphere of a planet with radius 6370 km, a density at sea level of 1.2 kg/m^3 and a constant $c = 0.000385$. My research has found that 99.9999% of this planet's atmosphere lies below an altitude of 100 km. Can you tell me what the mass of this planet's atmosphere is? So that I may refrain from bothering you further, I'd also appreciate an algebraic formula for calculating the mass in terms of R , δ_0 , c and upper bound of the atmosphere, H .

As this particular planet hinders my view of Venus, I'd like to test my device in early December (Venus is lovely at the winter solstice). Please respond by December 1.

Yours sincerely,

Marvin Martian
Commander X-23