Written assignment 3

Science, Mathematics

Algebra WK 6 Written Assignment Hint: Pay attention to the units of measure. You may have to convert from feet to miles several times in this assignment. You can use 1 mile = 5, 280 feet for your conversions.

1. Many people know that the weight of an object varies on different planets, but did you know that the weight of an object on Earth also varies according to the elevation of the object? In particular, the weight of an object follows this equation:, where C is a constant, and r is the distance that the object is from the center of the Earth.

a. Solve the equation for r. Use the Equation Editor.

b. Suppose that an object weighs 1, 000 pounds while it is at sea level. Find the value of C that makes the equation true. (Sea level is, on average, 3, 959 miles from the center of the Earth.)

C = w*r2 = (1000 lbs)*(3, 959 mi.)2 * (5, 280 ft.)2 / (1 mile)2

= 4. 370 x 1017 lbs-ft2

c. Use the value of C you found in the previous question to determine how much the object would weigh at

i. the shore of the Sea of Galilee (682 feet below sea level, that is, closer to the center of the Earth than sea level, so r is less than 3959 mi).

3, 959 mi. = 20, 903, 520 ft. and r = 20, 903, 520 ft. - 682 ft.

r = 20, 902, 838 ft.

w = C / r2 = (4. 370 x 1017 lbs-ft2) / (20, 902, 838 ft)2 = 1000. 16 lbs

ii. the top of Kilimanjaro (19, 341 feet above sea level, that is, further from the center of the Earth than sea level, so r is greater than 3959 mi).

r = 20, 903, 520 ft. + 19, 341 ft. = 20, 922, 861 ft.

w = C / r2 = (4. 370 x 1017 lbs-ft2) / (20, 922, 861 ft)2 = 998. 25 lbs

2. The equation gives the approximate distance, D, in miles that a person can see to the horizon from a height, h, in feet, assuming there are no obstructions in the way and accounting for atmospheric refraction. (Note that the units for D and h are different.)

a. Solve this equation for h.

Squaring both sides of , D2 = (1. 32)2 * (√h)2 makes

h = (D2) / 1. 7424

b. Longs Peak in Rocky Mountain National Park, is 14, 259 feet in elevation. Can you see Cheyenne, Wyoming (about 74 miles away at an elevation of 6, 062 feet, so youll have to subtract to get the height to use in the equation) from its summit? Use part a! Explain your answer. (I—your facilitator—used to live pretty close to Longs Peak; I could see it out my office window, and my brother lives in Wyoming. Ive been able to test this by looking for Longs Peak from Cheyenne since being able to see Longs Peak from Cheyenne is equivalent to being able to see Cheyenne from Longs Peak. Ive also climbed Longs Peak, but I didnt look for Cheyenne when I was there. If you do the algebra correctly, you do in fact get the same answer that Ive observed.

Solution:

h = 14, 259 ft. - 6, 062 ft. = 8, 197 ft.

So, D = 1. 32 * = 119. 51 miles ☾ this is the distance from the summit that an observer can view to the horizon and 74 miles is within this range, therefore, I would be able to see Cheyenne, Wyoming from the top of Longs Peak.