LPR Cup

10.s01.e03

Hint 2

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IMPORTANT! The next task is both a hint and an alternative to the main task. Three important points:

1. You can continue to send the solution to the main problem.
2. At any time before the final deadline, you can switch to *alternative task*. If you do this, write *a*t the very beginning of the solutionI'm moving on to an alternative task!. In this case, you get an additional coefficient of 0.7, which is multiplied by the old coefficient, and the solutions to the main problem are not checked from this point on. Be careful!
3. The task consists of several items. The penalty multiplier earned by **before** is applied to all points. In the future, each item is evaluated as a separate task. If you send a solution without any item, this item's solution is considered as Incorrect. For more information about scoring points for composite tasks, see the rules of the Cup.

Alternative problem

1. (*3 pts*) Two soap bubbles with radii $R_1 = 1.0$ cm and $R_2 = 0.7$ cm and with a wall thickness of $h = 0.2$ mm stick together. The coefficient of surface tension of the membrane is 40 mN/m. Determine the radius of curvature of the membrane separating the bubbles. What is the distance between the centers of the bubbles?
2. (*3 pts*) Cheburashka made another mirror from a bucket of mercury. To do this, he rotated the bucket around its axis with an angular velocity of ω. Determine the focal length of such a mirror. Acceleration of gravity is g.
3. (*3 pts*) Cheburashka wanted to get a real image of a long green object using a collecting lens. In the first experiment, he placed the object vertically at point A on the optical axis and obtained a lateral magnification factor Γ_1. Then he placed the object at point B on the optical axis and obtained a lateral magnification factor Γ_2. It turned out that the distance between points A and B is equal to the length of the object. After that, Cheburashka put the object so that the head was located at point A, and the tail was at point B. What is the coefficient of longitudinal increase in this case?

4. (*1 pts*) Using the result of the previous problem, prove that the speed of the image from an object moving along the main optical axis is Γ^2 times greater than the speed of the source. Where Γ is the coefficient of longitudinal magnification, at the location of the object at some point in time.