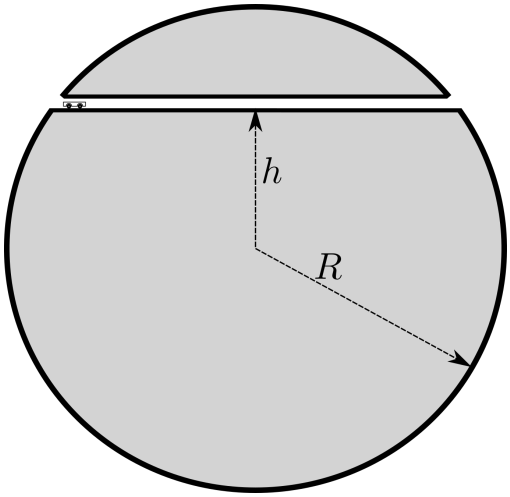
EXAM 1. Take home on Friday, July 9, due Monday, July 12, 10:00 am

Problem 1. *A Cart in the Earth*

1. A straight narrow shaft is drilled in the Earth as shown in the figure. What time will it take for a cart to travel from one end to another with zero initial velocity? Neglect air resistance, friction, and Earth rotation. Take the Earth to be a uniform sphere. Express your answer through the acceleration of free fall g and Earth radius R and length h.

2. How does this time depend on h?

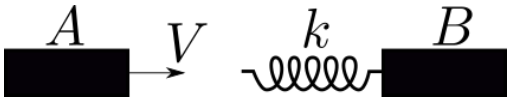


Problem 2. *Bricks and spring*

A brick A of mass m flying with the velocity V through space (no gravity, no air) hits head on an identical free brick B. The brick B has a spring of spring constant k attached to it. When the brick A touches the spring it gets glued to it.

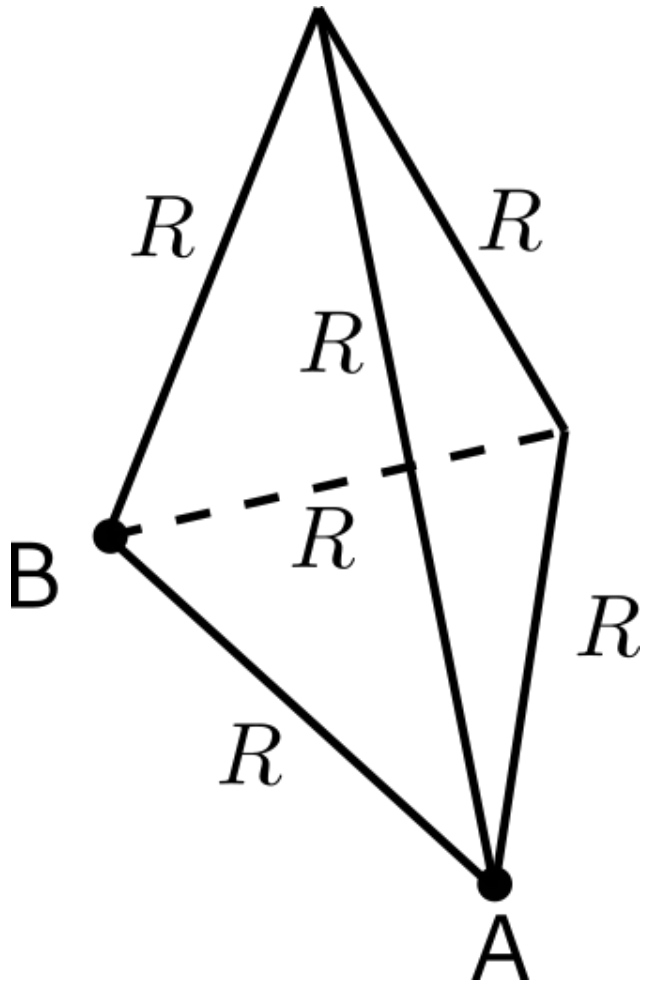
1. What will be the frequency of the oscillations of one brick with respect to another?

2. What will be the amplitude of these oscillations.



Problem 3. *Tetrahedron of resistors.*

A tetrahedron is made of metal wire. The resistance of each link is R. Find the resistance between the points A and B.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