PHYS 709: Advanced Mechanics I

Homework #0 - **Due Wednesday, September 04, 10 am**

Name:

This is typically given as an upper-level undergraduate problem. I'm not looking for your ability to solve, but focusing more on how you **present** the solution. Remember to use the simple physics problem-solving strategy:

1. Draw a sketch
2. Identify the knowns and unknowns
3. State the fundamental principles and assumptions
4. Comment on the results
    (a) Any limiting cases? Unusual behavior? Or special case simplifications?
5. Lots of words to describe your logic!

The hypothetical problem

Consider the dynamics of an object dropped through a hole bored all the way through the Earth's center to the opposite surface; think, digging to Australia! (Apparently Gnarabup, Australia is the closest city to Jackson, MS's antipodal point; or Port-aux-Français, French Southern Territories to Memphis, TN's antipode).

i. Find an expression for the force (as a function of distance from the Earth's center) on the body of mass m dropped through such a hole.

ii. Using realistic numbers, estimate the time it would take for the body to emerge on the other side of the Earth.

iii. Discuss/describe any consequences of the force.

You can assume the Earth has uniform density, is not rotating, and the hole is a pure vacuum [no melting at the Earth's core!].