

PHYSICS 331 ADVANCED CLASSICAL MECHANICS  
Problem Set 5

*Problem 1*

Thornton and Marion: Chapter 3, Problem 12.

*Problem 2*

Thornton and Marion: Chapter 3, Problem 18.

*Problem 3*

Thornton and Marion: Chapter 3, Problem 28.

*Problem 4* **Tunnel through the Centre of the Earth**

Suppose you managed to bore a tunnel in your garden so deep that it passes through the centre of the Earth and through to the opposite side. Unfortunately, your cat manages to fall into the hole while chasing a rabbit.

- (a) Write down the equation of motion for the cat in its plight. (Assume the Earth has a uniform mass distribution.)
- (b) Show that this motion is simple harmonic motion and determine how long it takes for your cat to return. (i.e. does it starve along the way?)
- (c) Based upon the location of your own backyard (or local park), determine the exact place visited by the cat in its journey through the centre of the Earth.

*Other Things*

Please re-read chapter 3 for next time and come send any comments to me based on the reading or the problems.