

PHY5246
Theoretical Dynamics
Problem Set 3

Due: Friday, Sept 22, 2006

3.1 Problem 2, GPS, Chapter 2, Pg. 63.

3.2 Problem 4, GPS , Chapter 2, Pg. 64.

Hint: Curves on the sphere can be described by functions of the form $\phi(\theta)$ where θ and ϕ are the usual spherical angles. To find the geodesics, write an integral expression for the length of such curves in terms of the function $\phi(\theta)$ with θ being the integration variable. Using the calculus of variations, obtain the Euler-Lagrange equation for those functions $\phi(\theta)$ which describe geodesics. From this equation you should be able to immediately write down a quantity which remains constant for such functions. Without loss of generality, you can take the initial point of the geodesic to be at the “north pole”, i.e. $\theta_1 = 0$ and obtain the form of the geodesics.

3.3 Problem 13, GPS, Chapter 2, Pg. 66.

3.4 Problem 19, (Parts (a), (b), (c) & (d) only), GPS, Chapter 2, Pg. 67.