

Math 537B Homework 3

March 2, 2006

1) 9.5

2) 10.3

3) Preview of next homework: don't turn in, but start thinking about the Taylor expansion of the volume of a geodesic ball of radius r , $V(r)$. It will require computing a Taylor series for $\sqrt{\det g_{ij}}$ which will use the following two facts which you should become familiar with. For a matrix valued function $g_{ij}(t)$,

$$\begin{aligned}\frac{d}{dt} \log \det g &= g^{ij} \frac{d}{dt} g_{ij} \\ \frac{d}{dt} g^{ij} &= -g^{ik} \left(\frac{d}{dt} g_{k\ell} \right) g^{\ell j}\end{aligned}$$

where g^{ij} is the inverse matrix and in the first line g represents the matrix g_{ij} .