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18.950 Differential Geometry
Fall 2008

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18.950 Homework 9

1. (4 points) Prove that a torus can't have Gauss curvature which is everywhere ≥ 0 (you may use the answers to the second midterm).

2. (6 points) Take $M = S^2$ to be the standard sphere. Find explicitly a moving frame with singularities on M , which (i) has exactly two singularities of multiplicity 1, and (ii) has exactly one singularity of multiplicity 2.

3. (4 points) Let $M = S^2$ again, and consider the function $\phi(y_1, y_2, y_3) = y_1^2$. Determine

$$\int_{S^2} \phi(y) \, d\text{vol}_y.$$

4. (6 points) Prove Lemma 28.3 from the lecture notes.