

Due: Mon. Sept 15

HMC Math 142 Fall 2005  
Prof. Gu  
Problem Set 1

Start this assignment before Sunday night!

**Read:**

- M. Do Carmo, Differential Geometry of Curves and Surfaces (well known as Baby Do Carmo): Sections 1-1, 1-2 and 1-3, Chapter 1
- Read Math142 all the rest of the review handouts
- Your Lecture Notes

**Do:**

**A: Problems on Reviewing of Inner Product Spaces and Orthogonal Maps**

1. Let  $C$  be an  $n \times n$  positive definite symmetric matrix and  $V$  be  $n$ -dimensional vector space with ordered basis  $S = \{u_1, u_2, \dots, u_n\}$ . For  $v = a_1u_1 + a_2u_2 + \dots + a_nu_n$  and  $w = b_1u_1 + b_2u_2 + \dots + b_nu_n$  in  $V$  define  $(v, w) = \sum_{i=1}^n \sum_{j=1}^n a_i c_{ij} b_j$ . Prove that this defines an inner product on  $V$ .
2. Prove the five ways of saying that a linear map is orthogonal (as in your handout 1c) are equivalent.

**B: Problems from Lectures**

1. Can you think one more way to view a circle?
2. Using two methods to show that a straight line is a shortest path between two points in  $R^3$ .

**D: Remember:**

- **Problem Sessions: Tuesday 5:00 – 6:00 PM, BK 134 and Office Hours: Tuesday 4:00 PM–5:00 PM and Thursday 4:00 PM–5:00 PM or by an appointment. Please feel free for help! I am here for YOU!**