

**MATH 401 HOMEWORK 2**  
**DUE ON FRIDAY 9-9-05**

Complete the following problems (the problems are taken from O'Neill's Elementary Differential Geometry, 2ed). You are encouraged to work with other students in the class on the problems. You may consult O'Neill's book on Elementary Differential Geometry or your lecture notes from class. You may not copy down the solution if it is in the "Answers to Odd-Numbered Exercises" section of O'Neill. However, once you complete your solution, you may check your answer to see if you did it "correctly." You may not consult the internet or other text books. You must write up your own solutions. Unless the problem is a computation, please use complete sentences when writing up your solutions. Show your work.

Late homeworks will receive no more than 50% credit and will not be graded.

1. 7, p. 27
2. 3, p.32
3. 7, p.32
4. 8, p. 32
5. Make sure you are familiar with all of the material from Section 2.1. Let  $\alpha : I \rightarrow \mathbb{R}^3$  be a regular curve in  $\mathbb{R}^3$  that does not pass through the origin. Suppose  $t_0 \in I$  is such that  $\alpha(t_0)$  is a point on the curve which is closest to the origin ( $t_0$  may not be unique). Show that the position vector  $\alpha(t_0)$  is orthogonal to  $\alpha'(t_0)$ .  
Note: By the position vector  $\alpha(t_0)$  I mean the vector starting at the origin and ending at the point  $\alpha(t_0)$ .