MATH 206, SPRING 2007, HOMEWORK 3

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There are five problems. You also need to complete Lab 1 this week. Please hand in this homework and the lab in separate stapled packets.

Section 1.5 Problem #6.

Section 1.5 Problem #12, but with the following modification: In Part B, instead of finding just the curvature, prove that

$$k(t)\vec{n}(t) = \frac{(\vec{\alpha}' \times \vec{\alpha}'') \times \vec{\alpha}'}{|\vec{\alpha}'|^4}.$$

Then use this to find both $k(t)$ and $\vec{n}(t)$. This problem requires heavy use of the chain rule.

Section 1.6 #1. You'll find this much easier if you read the section in detail. It's short.

Section 1.7 #8. To solve this, the material on p. 37 is essential. We have not discussed it, but you may assume it. The rotation index also goes by the name *winding number*; it is a rather pretty differential-topological concept that shows up here and in complex analysis.

Section 1.7#6. Do only Part A. Assume that $\vec{\alpha}$ is parametrized by arc length (although $\vec{\beta}$ will not be). The curve is convex, although the one in Figure 1-37 is not. You may assume that any positively oriented convex curve is simple, as in the remark on p. 40.