18.950 Differential Geometry
 Fall 2008

18.950 Homework 1

1. (5 points) How does the curvature of a regular curve change under the following transformations of the plane $\mathbb{R}^2$: (a) translation, (b) rotation, (c) reflection, (d) dilation $x \mapsto rx$?

2. (5 points) Compute the curvature of an ellipse. Where does it reach its maxima and minima?

3. (10 points) Let c be a regular curve such that $\|c(s)\| \leq 1$ for all s. Suppose that there is a point t where $\|c(t)\| = 1$. Prove that the curvature at that point satisfies $|\kappa(t)| \geq 1$.