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18.950 Differential Geometry  
Fall 2008

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## 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  $|\kappa(t)| \geq 1$ .