Differential geometry
Spring 2012
Exercise 3.

1. Compute the curvature and torsion of curve $c : [0, 2\pi] \mapsto \mathbb{R}^3$

$$c(\theta) = (\cos(\theta), \sin(\theta), 1).$$

2. Determine the osculating, rectifying and normal planes for curve from previous exercise.

3. Compute the curvature and torsion of the twisted cubic curve $c : \mathbb{R} \mapsto \mathbb{R}^3$, $c(t) = (t, t^2, t^3)$.

4. Compute the curvature and torsion of a curve $c : \mathbb{R} \mapsto \mathbb{R}^3$

$$c(u) = (3u - u^3, 3u^2, 3u + 3u^3).$$

5. Compute the representation for the stereographic projection defined in lecture notes example 3.1 as homeomorphism ϕ_1.

6. If the surface is a graph given by smooth function $g : \Omega \mapsto \mathbb{R}$, $\Omega \subset \mathbb{R}^2$ compute its tangent space and normal vector.

7. Report all the possible errors in lecture notes.