1: Recall the definition of curvature and torsion (of a curve in $\mathbb{R}^3$, via / in arc-length parametrisation).

2: Prove the reparametrisation invariance of

$$\tau = -\frac{1}{k^2}|\dot{\vec{r}}\,\ddot{\vec{r}}\,\dddot{\vec{r}}| / |\dot{\vec{r}}|^6 = -|\dot{\vec{r}}\,\ddot{\vec{r}}\,\dddot{\vec{r}}| / (\dot{\vec{r}}\times\ddot{\vec{r}})^2$$

3: Calculate k and τ for a helix, $\vec{r}(t) = (a\cos t, a\sin t, bt)$.

4: Find a polynomial (of degree 2 in x^2, y^2 and z^2) such that $P \equiv 0$ describes the 2-torus, $((a+b\cos u)\cos v, (a+b\cos u)\sin v, b\sin u)$.

5: Cover the 2-sphere via 2 stereographic projections and calculate the transition functions.

6: Prove non-orientability of the Möbius-strip $((2-v\sin(u/2))\sin u, (2-v\sin u/2)\cos u, v\cos u/2)$.

7: Calculate the distance between north- and south-pole of S^2 using the first fundamental form in stereographic projection parametrisation.

8: Prove reparametrisation invariance of

$$A = \int_U \sqrt{g}\,du\,dv$$

9: Calculate the principal curvatures of the helicoid, from $\vec{X}(u,v) = (\sinh u\cos v, \sinh u\sin v, v)$