

- 9.1.** Show that the projective curve D in $\mathbb{C}P^2$ defined by the homogeneous polynomial $p(x, y, z) = y^2z - x^3$ has a unique singular point. Show that the map $f : \mathbb{C}P^1 \rightarrow D$ defined by

$$f[s, t] = [s^2t, s^3, t^3]$$

is a homeomorphism. Deduce that the genus-degree formula cannot be applied to singular curves in $\mathbb{C}P^2$.

- 9.2.** Compute the signature of the blow-up of $\mathbb{C}P^2$ at $k \geq 0$ points.
- 9.3.** Compute the signature of the product of two compact Riemann surfaces $S_1 \times S_2$.
- 9.4.** Show that hypersurfaces in $\mathbb{C}P^n$ for $n \geq 3$ do not admit non-trivial holomorphic one-forms.