

Differential Geometry

Module III

Chapter 10 : The Curvature of Plane Curves

June 28, 2023

Curvature

In \mathbb{R}^2 ,

Weingarten map $L_p : C_p \rightarrow C_p$ is $L_p(\mathbf{v}) = \kappa(p)\mathbf{v}$

Curvature of plane curve C in \mathbb{R}^2 is

$$\kappa : \mathbb{R}^2 \rightarrow \mathbb{R}, \quad \kappa(p) = L_p(\mathbf{v}) \cdot \mathbf{v} / \|\mathbf{v}\|^2$$

It turns out that, the curvature is a measure of the normal component of acceleration,

$$\kappa(\alpha(t)) = \frac{\ddot{\alpha}(t) \cdot \mathbf{N}(\alpha(t))}{\|\dot{\alpha}(t)\|^2}$$

Thank You