DIFFERENTIAL GEOMETRY OF CURVES AND SURFACES (MTH 406) ASSIGMENT-2

Submission date: 21-01-2020

Problem-A. Submit an answer of all problems.

(1) Show that, if the curvature $\kappa(t)$ of a regular curve $\gamma(t)$ is > 0 everywhere, then $\kappa(t)$ is a smooth function of t. Give an example to show that this may not be the case without the assumption that $\kappa > 0$.

(2) Let γ be a regular curve in $\mathbb{R}^3$ with nowhere vanishing curvature. Show that, the image of γ is contained in a plane if and only if torsion τ is zero at every point of the curve.

(3) Solve excercise 2.1.1(i), 2.1.1(iii), 2.3.1, 2.3.2 from Chapter 2.

(4) Find an unit speed curve plane curve whose curvature function is $1/(1+s^2)$.

Problem:B. You don't need to submit it.

(1) Let γ be a unit-speed curve in $\mathbb{R}^3$ with constant curvature and zero torsion. Show that γ is (part of) a circle.

(2) Solve 2.2.1, 2.2.2, 2.2.4, 2.3.4, 2.3.5, 2.3.6 from Chapter 2.

(3) Find an unit speed curve space curve whose curvature and torsion function are $1/(1+s^2)$.

(4) Find the curvature fuction for the curve $\gamma(t) = (t, sin(t))$.

Text Book: Elementry Differential Geometry, Andrew Pressley 2nd edition

Date: 08-01-2020.