Mathematics 551 Homework, February 14, 2020

Read the first part of Section 1.2 up to Proposition 2.4 (Pages 10–15) in Shifrin's book. He does a good job of explaining the three dimensional Frenet Formulas. He includes the example we did in class of the unit speed helix. In this notation it is the curve

$$\boldsymbol{\alpha}(s) = (a\cos(s/c), a\sin(s/a), bs/c) \tag{1}$$

where

$$c = \sqrt{a^2 + b^2}.$$

The curvature and torsion are

$$\kappa = \frac{a}{a^2 + b^2} \tag{2}$$

$$\tau = \frac{b}{a^2 + b^2}. \tag{3}$$

Problem 1. Given constants $\kappa > 0$ and τ find constants $a > 0$ and b so that the Equation (2) and (3) hold. That is find a and b so that the helix in Equation (1) has curvature κ and torsion τ. □

Problem 2. In Page 18 of Shifrin do

(a) Problem 3a.
(b) Problem 3c.
(c) Problem 3d.

Note that for Problems 3a and 3c the answers are in the back of the text. □

Problem 3. Shifrin Problem 11, Page 19.