Ma 410 - Differential Geomtery Hw-2 Due: September 21, 2022 by 11:59 pm

Name (Printed):

Pledge and Sign:

Upload solutions to Grade Scope by the due date. Assign solution pages to corresponding problems. You need to pledge and sign on the cover page of your solutions. You may use this page as the cover page.

Legibility, organization of the solution, and clearly stated reasoning where appropriate are all important. Points will be deducted for sloppy work or insufficient explanations.

1. (a) [5 pts.] Show that the curve $\alpha(t) = (\cosh t, \sinh t, t)$ has arclength function $s(t) = \sqrt{2}\sinh t$, where $\cosh t = \dfrac{e^t + e^{-t}}{2}$ and $\sinh t = \dfrac{e^t - e^{-t}}{2}$.

(b) [5 pts.] Show that $\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$.

(c) [5 pts.] Find an arclength parameterization for α.

2. (a) [10 pts.] Compute the Frenet apparatus, κ, τ, T, N and B of the unit speed curve

$$\beta(s) = \left(\frac{4}{5}\cos s, 1 - \sin s, -\frac{3}{5}\cos s\right).$$

(b) [5 pts.] Show that this curve is a circle; Find its center and radius.