Ma 410 - Differential Geometry **Hw-4** **Due: October 5, 2021 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. [10 pts.] If α is a curve with $\kappa > 0$ and τ both constants, show that α is a circular helix. [Hint: Use Problem 3. of Hw3. Indeed, you need to prove γ as obtained there is a circle if and only if both τ and κ are constant.]

2. Let $F(u, v) = (u^2 - v^2, 2uv)$ be mapping from $\mathbb{R}^2$ to $\mathbb{R}^2$.

(a) [5 pts.] Sketch the horizontal line $v = 1$ and its image under F. What is the curve?

(b) [5 pts.] Sketch the vertical line $u = 1$ and its image under F. What is the curve?

(c) [10 pts.] Find a formula for the Jacobian of F at all points. Show that F_* is 1-1 at every point other than the origin.