

Mathematics 551 Test #1 Name: _____

Show your work! Answers that do not have a justification will receive no credit.

(1) (10 Points) State the Frenet formulas for a C^3 regular unit speed curve in \mathbb{R}^3 carefully defining all the quantities involved.

(2) (15 Points) Show that if $\alpha: [a, b] \rightarrow \mathbb{R}^3$ is a unit speed curve with torsion $\tau \equiv 0$, then α is contained in a plane.

(3) (10 points) Let $ds^2 = du^2 + u^2dv^2$ be the first fundamental form of a patch on a surface. Find the length of the curve give by $u(t) = e^t$ and $v(t) = t$ for $1 \leq t \leq 2$.

(4) (10 points) For the Monge patch $X(u, v) = (u, v, uv)$ defined on $0 \leq u, v \leq 1$ set up the integral for finding the area of the image of X . (Do not evaluate this integral.)

(5) 5 free points.