MA 313: Nominal study guide for Exam 2

Here are some things you should be sure to know for the exam. You should know other things too.

1. Definitions

- Symmetric, bilinear form
- Inner product
- Smooth surfaces
- Regular surfaces
- normal vector
- tangent plane
- surface patch (i.e. chart)
- derivative of a map $f\colon S \to \widetilde{S}$
- orientable surface
- ruled surface
- surface of revolution
- First Fundamental Form
- Local isometry
- Second Fundamental Form
- Gauss map
- Weingarten map
- normal curvature
- geodesic curvature

2. Results

You should know the statements of these results, how to use them, and the key components of their proofs. For those proofs that are very long or involved you will not be asked to recreate the entire proof.

- The four vertex theorem
- Pay attention to examples esp for surfaces like ruled surfaces and surfaces of revolution.
- Be able to motivate the definition of E, F, G and L, M, N
- Be able to prove that the tangent space to a surface at a point is equal to the span of σ_u and σ_v (the partials of a surface patch)
- Theorem 6.2.2: A smooth map between surfaces is a local isometry if and only if the first fundamental form of the domain is equal to the pull-back of the first fundamental form of the codomain
- Proposition 7.2.2: the second fundamental form is equal to $\langle \mathscr{W}\mathbf{v}, \mathbf{w}\rangle$.
- Proposition 7.3.3: If γ is a unit speed curve on an oriented surface, its normal curvature is the second fundamental form applied to $\dot{\gamma}$.
- The following concepts are equivalent: symmetric, bilinear forms; symmetric matrices; degree two polynomials.