

## FINAL REVIEW I: TOPICS

### 1. Info about final.

- 2 hours; About 7 regular problems and 1 to 2 bonus problems;
- Similar level of difficulty (may feel slightly harder due to the amount of material covered) as the midterms;
- To prepare:
  - Midterms and homeworks;
  - Lecture notes;
  - Required sections in the textbook;
  - Optional sections in the textbook.

### 2. Required topics of 348.

	Curves in $\mathbb{R}^3$	Surfaces in $\mathbb{R}^3$	Curves on Surfaces	Mapping between Surfaces
Representation	Parametrized curves Re-parametrization Arc length parametrization Local frame $T, N, B$ Frenet-Serret equations	Surface patch Tangent plane Local frame: $\sigma_u, \sigma_v, N_S$ Christoffel symbols Weingarten map	The curve The tangent	$f, D_p f$ Calculate $D_p f$ Gauss map and related calculation
Measurements	Calculation of arc length	Surface area First fundamental form Second fundamental form	Arc length Angles between curves	
Curving	Curvature $\kappa$ Torsion $\tau$ Signed curvature (plane curve)	Normal curvature $\kappa_n$ Principal curvature $\kappa_1, \kappa_2$ Principal vectors $t_1, t_2$ Mean curvature $H$ Gaussian curvature $K$	Geodesic curvature $\kappa_g$ Covariant derivative Parallel transport Geodesics	
Theorems, Equations		Gauss equations Codazzi-Mainardi equations	Parallel transport equations Geodesic equations Gauss-Bonnet	Gauss's Remarkable Theorem Gauss-Bonnet for compact surfaces

**Table 1.** Topics covered in 348. Red equations will be provided in the final