

## TOPICS FOR MATHEMATICS 138A, WINTER 2004

### I. Classical differential geometry of curves

1. Cross products (do Carmo, §1-4)
2. Parametrized curves (do Carmo, §1-2)
3. Arc length and reparametrization (do Carmo, §1-3)
4. Curvature and torsion (do Carmo, §§1-5, 1-6)
5. Frenet-Serret Formulas (do Carmo, §§1-5, 1-6, 4-Appendix)

### II. Closed curves as boundaries

1. Regions, limits and continuity (do Carmo, 2-Appendix A, 5-Appendix)
2. Smooth mappings (do Carmo, 2-Appendix B)
3. Inverse and implicit function theorems (do Carmo, 2-Appendix B)
4. Global properties of plane curves (do Carmo, §1-7)

### III. Surfaces in 3-dimensional space

1. Mathematical descriptions of surfaces (do Carmo, §§2-2, 2-3)
2. Parametrizations of surfaces (do Carmo, §§2-2, 2-3)
3. Tangent planes (do Carmo, §2-4)
4. The First Fundamental Form (do Carmo, §2-5)
5. Surface area (do Carmo, §§2-5, 2-8)
6. Curves as surface intersections (do Carmo, §2-3)

### IV. Oriented surfaces

1. Normal directions and Gauss maps (do Carmo, §§2-6, 3-2)
2. The Second Fundamental Form (do Carmo, §§3-2, 3-3)
3. Quadratic forms and adjoint transformations (do Carmo, 3-Appendix)
4. Normal, Gaussian and mean curvature (do Carmo, §§3-2, 3-3)
5. Special classes of surfaces (do Carmo, §3-5)
6. Compatibility equations, *Theorema Egregium* (do Carmo, §4-3)
7. Fundamental Theorem of Local Surface Theory (do Carmo, §4-3, 4-Appendix)