Do carmo differential geometry solutions

Instructor: Henrique Bursztyn (henrique@math) Go to the bottom to see your marks . Textbook : Elementary Differential Geometry, by A. Pressley (Springer-Verlag). Suggested complementary reading: Differential Geometry of Curves and Surfaces, by M. do Carmo (Prentice-Hall). Lectures: MWF 3pm in RW 143. Teaching Assistant: Brian Lee (tensorman@yahoo.com). Office hours: Mondays 4-5pm in SS 2131 (B. Lee) and Wednesdays 4-5pm in SS 2115 (HB). Course outline: This is an introductory course on differential geometry. We will focus on the study of curves and surfaces based on the methods of differential calculus. We will try to cover most of the chapters in the book, aiming at the Gauss-Bonnet Theorem (but probably skipping a few sections on the way). Here is a brief outline: Parametrized curves; curvature and torsion. Global properties of plane curves, isoparametric inequality. Surfaces, atlases, orientability; isometries, conformal maps. The first fundamental form. Curvatures of surfaces (principal, gaussian, mean), the Gauss map, the second fundamental form. Geodesics; parallel transport, covariant derivative. Gauss's Theorema Egregium. The Gauss-Bonnet Theorem, applications. Exams: We will have one midterm exam on February 9, and a final exam. MIDTERM, Feb. 9 in class. It covers chapters 1, 2, 3 and 4 (up to Section 4.4). Problem sets: I will assign around 5 problem sets throughout the semester to be handed in in class, dates and deadlines to be announced. Late Homeworks will not be accepted (except for extenuating circumstances). Solutions to problem sets are individual . Grades: Problem sets: 20%, Midterm: 30%, Final: 50%. There will be no make-up exams. Suggested Problems : I will post weekly suggested problems from the book below (not to be handed in): WEEK 1: Chapter 1: 1.2(i), 1.7, 1.8 (Sec. 1.1); 1.13 (Sec. 1.2); 1.14(iii), 1.16 (Sec. 1.3). Click here for interesting examples of curves. WEEK 2: Chapter 2: 2.1(i),(ii) (Sec. 2.1); 2.6, 2.8, 2.9 (Sec. 2.2); 2.14, 2.15, 2.17, 2.22 (Sec. 2.3). WEEK 3: Chapter 3: 3.3 (Sec. 3.1); 3.6, 3.8 (Sec. 3.3). WEEK 4: Chapter 4: 4.3, 4.4 (Sec. 4.1); 4.6, 4.7, 4.9, 4.10 (Sec. 4.2). WEEK 5: Chapter 4: 4.13, 4.14, 4.16 (Sec. 4.3); 4.19, 4.20, 4.21 (Sec. 4.4); Chapter 5: 5.1, 5.4 (Sec. 5.1); 5.15, 5.16 (Sec. 5.4). WEEK 6: Chapter 5: 5.5, 5.6, 5.7 (Sec. 5.2); 5.9, 5.11, 5.13, 5.14 (Sec. 5.3). WEEK 7: Chapter 6: 6.1, 6.2 (Sec. 6.1); 6.5, 6.6, 6.7, 6.9, 6.11 (Sec. 6.2); 6.15, 6.16, 6.18, 6.19 (Sec. 6.3). WEEK 8: Chapter 6: 6.23, 6.24 (Sec. 6.4); Chapter 7: 7.1, 7.2, 7.3, 7.4, 7.5, 7.7 (Sec. 7.1); 7.11, 7.12 (Sec. 7.2); 7.18, 7.19 (Sec. 7.6). WEEK 9: Chapter 8: 8.1, 8.2 (Sec. 8.1); 8.6, 8.7, 8.8, 8.10 (Sec. 8.2); 8.13, 8.14, 8.15, 8.16 (Sec. 8.3); 8.19 (Sec. 8.4), 8.21 (Sec. 8.5) WEEK 10: Chapter 10: 10.2, 10.3, 10.4 (Sec. 10.1); 10.5, 10.6 (Sec. 10.2); 10.9, 10.10 (Sec. 10.3); Chapter 11: 11.1, 11.2 (Sec. 11.1). WEEK 11: Chapter 11: 11.3, 11.4 (Sec. 11.2); 11.9, 11.10, 11.12 (Sec. 11.3). WEEK 12: Chapter 11: 11.14, 11.15 (Sec. 11.4) WEEK 13: Chapter 11: 11.17, 11.18 (Sec. 11.5). Final Exam Info: The sections that we covered in the book are listed above (along with suggested problems). Some of the material was presented in class in a slightly different way than in the book (e.g. the relationship between the tangent map of the Gauss map and the first and second fundamental forms, principal curvatures...), so I encourage you to go over class notes as well. Back to the main page Instructor: Henrique Bursztyn (henrique@math) Go to the bottom to see your marks . Textbook : Elementary Differential Geometry, by A. Pressley (Springer-Verlag). Suggested complementary reading: Differential Geometry of Curves and Surfaces, by M. do Carmo (Prentice-Hall). Lectures: MWF 3pm in RW 143. Teaching Assistant: Brian Lee (tensorman@yahoo.com). Office hours: Mondays 4-5pm in SS 2131 (B. 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Some of the material was presented in class in a slightly different way than in the book (e.g. the relationship between the tangent map of the Gauss map and the first and second fundamental forms, principal curvatures...), so I encourage you to go over class notes as well. Back to the main page From time to time I give guest lectures in Math 561. Here are some notes from those lectures. I am no longer lecturing this course, and the syllabus has changed. Please check the official course websites for relevant information. I have left this archive available for anyone interested. Course notes Notes for course of 2012. Course notes Exercises Sheet 1 Sheet 2 Sheet 3 Sheet 4 Sheet 5 Sheet 6 Handwritten solutions by Tom Collyer: Solutions 1 Solutions 2 Solutions 3 Solutions 4 Solutions 5 Solutions 6 Other people's lecture notes Detailed notes on an earlier version of the course by George Terizakis (1998/1999) are available via MathStuff here. There is considerable overlap with the current course, though some things will be approached differently. The Geometry of Surfaces course notes by Nigel Hitchin at the University of Oxford (particularly Chapter 4, a.k.a. "Chapter 3, Surfaces in R^3"!) give a very nice concise introduction. I used some material from this in preparing the course. Webpages This course has a MathsStuff page, where you can find some ``archived material" from long ago. Catenoid-helicoid deformation: Animation (Mathematics Museum, Ibaraki University.) Interactive (Visual geometry, Technische Universitat, Berlin.) Stills (Minimal surfaces, Indiana University.) Books (1) John McCleary, "Geometry from a differential viewpont" : Cambridge University Press 1994. (QA 641 M2). [A more modern account of some classical material. Some material was used in preparing this course.] (2) Dirk J. Struik, "Lectures on classical differential geometry" : Addison-Wesley 1950 (QA 641 S8). [Classical treatment, good reference for much of the material]. (3) Manfredo P. do Carmo, "Differential geometry of curves and surfaces" : Prentice-Hall 1976 (QA 641 C2). [More traditional approach. Lots of examples.] (4) Barrett O'Neill, "Elementary differential geometry" : Academic Press 1 1966 (QA 641 O6). [More general introduction to classical differential geometry, with sections on curves and surfaces.] (5) Sebastian Montiel, Antonio Ros, "Curves and surfaces", American Mathematical Society 1998 (QA 643 M6613). [More modern and advanced treatment.] (6) Alfred Gray, "Modern differential geometry of curves and surfaces" : CRC Press 1993 (QA 641 G7). [Practical introduction to curves and surfaces, with many illustrations.]

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