
Math. 313 - Topics and Assignments

Based on "Fundamentals of Complex Variables with applications to Engineering and Science", 3rd ed. by Saff & Snider.
This syllabus will be regularly updated to reflect actual class pace.

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Modified Last: Fri Jan 21 00:22:52 MST 2005

Only problems marked by (*) should be turned in. Mark each assignment by the number of the week during which it was assigned, and clearly list at the top of the front page your name and the problems included, identified by section and page number if they come from one of the required texts.
Problems that are assigned during any week are due in class on Thursday of the following week.
Class meets Tuesdays & Thursdays at 8:00-9:15 in Mitchell 206

WEEK 1 Complex algebra

1(1/18) History: Number systems. Complex arithmetic. Division
Ch.1, Sec.1 (9,10*,15*,16,17*,18,21,23*,24)

2(1/20) Moduli, conjugates; the Argand-Wessel plain (or C-plane)
Ch.1, Sec.2 (7(a,b*,d*,e*,f*,g,i),8,17*,19*)

<<< UNDER CONSTRUCTION BELOW THIS POINT!!!! >>>
(material below is from a previous syllabus based on the text by Churchill, and it will be modified as we go)

WEEK 2 Complex algebra and functions

3(1/25) Polar form, Euler and Moivre formulas, trig. formulas
More trig. formulas. Roots. Domains.
Ch.1, Sec.(6-7-8)
p.22, Sec.7(1<a,b*>,2<a*,b,c,d*>)
p.25, Sec.8(1<a*,b,c*,d,e*,f>,3*,7<a*,b>)
Functions of a Complex Variable. Mappings
Ch.2, Sec.(9-10)
p.32, Sec.10(4,5*,6*,7*,12*,13)

4(1/27) Limits and the point at infinity. Continuity
Ch.2, Sec.(11-12-13-14)
p.42, Sec.14(1<c*,g>,2<a*,b>,9<a*,b*,c>,11*)

WEEK 3 Differentiation and analytic functions

5(2/01) Derivatives and the Cauchy-Riemann equations.
Sec. 2.(15-16-17-18)
p.47, Sec.16(1<c*,d>,2*,3,8<a*,b,c*.)
Analytic functions and the reflection principle.
Sec. 2.(19-20-21)
p.54, Sec.19(1<a*,b>,3<a,b*>)

6(2/03) Harmonic functions.
Sec. 2.(22)
p.62, Sec.22(1<a,b*>,2<a,c*>,4<a,b*>,10<a,b*>)

WEEK 4 Elementary functions

7(2/08) Exponential, trigonometric and hyperbolic functions.
Sec. 3.(23-24-25)
p.67, 23(3,4,8<a*,b*,c>)
p.71, 24(16*,17)
p.74, 25(14<a*,b,c>)
Logarithms
Sec. 3.(26-27)
p.79, 27(1(a,b), 2(a*,b*,c), 4(a*,b*), 5(a,b), 7, 13(a,b*), 17*)

8(2/10) Complex exponents. Review.
Sec. 3.(28-29)
p.84, 29(1(a*,b), 2(a*,b), 12*)

WEEK 5 Mappings

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 9( 2/15) Linear fractional transformations
          Sec. 8.(68-69-70)
          p.250, 69(4*,5*,9,10*,11,13)
10( 2/17) Circles and half-planes
          Sec. 8.(71-72)
          p.258, 72(1*,2,3*,4*,6,7*)
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                              WEEK 6 Mappings and multi-valued functions
11( 2/22) Conformal mapping, Square roots and their branches.
          Sec. 8.(73,75,79,80)
          p.275 (3*,4), p.289 (1*,2,3*,4)
12( 2/24) Square roots of polynomials; Riemann surfaces
          Sec. 8.(76, 77, 78)
          p. 281 Sec.78(1*,2)
          Review problems
          p.260, (11*,12,13*,14*,15)
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                              WEEK 7 Contour integrals
13( 2/28) Contour integrals and examples.
          Sec. 4.(30-31-32-33)
14( 3/ 2) Antiderivatives and examples.
          Sec. 4.(34-35)
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                              WEEK 8 The Cauchy-Goursat thm
15( 3/ 9) +++++++++++++ Exam I (Material from Wk1-6)
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16( 3/11) The Cauchy-Goursat theorem and sketch of the proof.
          Sec. 4.(36)
          p. 276 Sec.76(9(a*,b),10*,11)
          p. 281 Sec.78(6,7*)
          p.102, Sec.33(1(abc)*,4*,9*,14*,16*)
          (problems due on Mar. 25)
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  ( 3/15 - 3/19:  SPRING BREAK       )
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                              WEEK 9 Cauchy formula and consequences
17( 3/23) Proof of the Cauchy-Goursat theorem.
          Sec. 4.(37)
          Simply and multiply conected domains.
          Sec. 4.(38)
          Sec. 38, p.120 (2*, 7*, 8*)
18( 3/25) The Cauchy integral formula for analytic functions and derivatives.
          Sec. 4.(39-40)
          Sec. 40, p.128 (1<a*,b*,c,d*,e>, 3*)
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                              WEEK 10 Analytic functions
19( 3/30) Antiderivatives, Morera's thm, Maximum modulus thm
20( 4/ 1) The fundamental theorem of algebra
          Sec. 4.(41-42) p.136(1*,2*,3*,4*,6*,7*)
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                              WEEK 11 Series
21( 4/ 6) Sequences and series;  the Taylor theorem.
          Sec. 5.(43-44-45) p.142(1*,4*,5*), p.149(1,2*,3*,5*,6,8*)
22( 4/ 8) Laurent series.
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                              WEEK 12 Residues and singular points
23( 4/13) Introduction to isolated singular points and residues
24( 4/15) Laurent series. Uniform convergence. Manipulations of series.
          Sec. 5.(46-47) p.156(1,3*,4*,5*,6,7)
          Sec. 5.(48-49) p.173(2,4*,5*,7*,8*)
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                              WEEK 13 Integration
25( 4/20) Zeros and Poles. Essential singularities.
          Sec. 6.(53-54-55) p.188(1<a,b,c,d,e>,2<a*,b,c*,d>,3<a,b,c>,
                                  4<a,b*,c*,d,e*>,5<a*,b,c*>,8*)
          Sec. 6.(57-58-59) p.197(1,3<a*,b*,c,d>,4,5,7<a*,c>,9)
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26( 4/22) Improper integrals
          Improper integrals involving sines and cosines. Fourier integrals.
          Sec. 7.(60) p.208(1,2,3,4,7*,9*)
          Sec. 7.(61) p.214(1*,2*,7,9)
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                        WEEK 14 Integration
27( 4/27) Integrals along branch cuts; Integrals on the half-line
          Sec. 7.(64)
          Definite integrals involving sines and cosines
          Sec. 7.(62)
28( 4/29) Indented paths
          Sec. 7.(63)
          p.208(5,6), p.215(9), p.219(2), p.226(1)
*****     Rouche's theorem
          Sec. 7.(65)
******     Inverse Laplace transforms
          Sec. 7.(66)
          (p.215(12), p.219(6), p.226(2))
  Take-home Exam II Given out in class
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                        WEEK 15
29( 5/ 4) Overview
          Exam II Due in class
30( 5/ 6) Review
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----------- Final Examination  Thursday, May 13, 7:30-9:30
NOTE: ********* denote material that could possibly be skipped or summarized
                to allow for reviews or catch-up.
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               Subject to change below this line!
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