

## Mathematical Methods for the Physical Sciences

### Academic Calendar and Homework Assignments

Week	Lecture No.	Date	Chapter/Exam	Homework
1	1	Tue, Jan 22	Introduction. Course logistics. Benefits and challenges of CAS. Low entropy expressions. Differential operator. Translation (shift) operator.	
	2	Thu, Jan 24	Euler-MacLaurin summation formula. Logarithmic derivatives. A very short introduction to Mathematica: Exp[x], Series[...{x,0,6}].	
2	3	Tue, Jan 29	Euler-MacLaurin summation formula, II. Properties of the differential operator.	
	4	Thu, Jan 31	Ordinary differential equations I.	
3	5	Tue, Feb 5	Ordinary differential equations II. A very short introduction to sympy.	HW1 due
	4	Thu, Jan 31	Ordinary differential equations III.	
4	7	Tue, Feb 12	Complex numbers and complex variables: coordinate and polar form; Euler's formula; trigonometric identities; complex roots.	
	8	Thu, Feb 14	Ch. 2B, Analytic functions; Cauchy-Riemann equations. Contour integrals in the complex plane. Gaussian integrals.	HW2 due
5	9	Tue, Feb 19	Cauchy integral theorem.	
	10	Thu, Feb 21	Singular points; residues; evaluation of integrals I.	
6	11	Tue, Feb 26	Evaluation of integrals II.	
	–	Thu, Feb 28	<b>Midterm I</b>	HW3 due
7	12	Tue, Mar 5	Midterm I review; Evaluation of integrals III.	
	13	Thu, Mar 7	Laplace method for solving ODEs.	
8	14	Tue, Mar 12	Laplace method for integrals; Gamma function, $\Gamma(x)$ . Stirling formula.	
	15	Thu, Mar 14	Laplace method, II.	
9		Tue, Mar 19 Thu, Mar 21	<i>Spring recess</i> <i>Spring recess</i>	
10	16	Tue, Mar 26	Method of stationary phase.	HW4 due
	17	Thu, Mar 28	First order PDE. Characteristics. Hydrodynamic description of traffic	

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11	18	Tue, Apr 2	First order PDE, II. Eulerian and Lagrangian description of flows.	
	19	Thu, Apr 4	First order PDE, III.	
12	20	Tue, Apr 9	<b>Midterm II</b>	HW5 due
	21	Thu, Apr 11	Midterm II review. Take-home project discussion.	
13	22	Tue, Apr 16	Fourier integrals. Dirac $\delta$ -function.	
	23	Thu, Apr 18	Properties of Dirac $\delta$ -function. Partial differential equations (PDE) I: Laplace equation.	
14	24	Tue, Apr 23	PDE II: diffusion equation.	
	25	Thu, Apr 25	Fourier series. PDE III	
15	26	Tue, Apr 30	PDE IV.	
	27	Thu, May 2	Random walks, diffusion, and Levi flights.	HW6 due
16	-	Thu, May 9	<b>FINAL EXAM</b> , 1pm–3pm, M407	

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