

Advanced Mathematical Techniques Assignments
Dr. Osborne 2019

G. Arfken and H. Weber, *Mathematical Methods for Physicists*, Elsevier Press, 6th. Ed, 2005... *=possible error in book

Assn	Topic(s)	Assignment	Start	Due
	First Day Sheet due 1 February			
1	Functional Representations Power Series	5.1.1; 5.2.7, 10; 5.6.14, 17 Worksheet	1/30	2/22
2	Expansions Approximation Techniques Infinite Products	5.7.4, 7, 15, 19(a); 5.8.1, 5; 5.11.5, 6, 9 Worksheet	2/6	3/1
3	The Gamma Function The Beta Function Integral Representations Special Integrals Integrals including Logarithms	8.1.7, 8 Worksheet NOTE: This assignment is shorter than 4. Start 4 early... just a suggestion...	2/20	3/8
4	More Integrals including Logarithms The Riemann Zeta Function	5.9. 8, 9, 10*, 11, 12 (closed also), 13; 8.2.11, 14; 8.4.6, 9, 10 Worksheet EC: Write a short paper explaining the Bernoulli Polynomials and their properties. Develop the Euler-Maclaurin Integration Formula and discuss some of its properties. Then do problems 5.9.2, 3, 5(d)*	3/1	3/15
5	Regularization of Singularities Asymptotic Expansions	5.10.4 (hint: $u = t^2$), 8* Worksheet	3/6	3/22
Exam on Representations, Expansions, and Special Functions on 22 March				
6	Reduction to Quadrature First and Second Integrals; Periods	8.4.14, 15 Worksheet	3/20	4/1
7	Mathematical Models Probability Distributions	8.1.23, 24; 8.4.17; 9.2.5,14 Worksheet	3/22	4/12
8	The Boltzmann Factor Atomic Speed Distributions Planck and the Stefan-Boltzmann Law	5.6.19* (geometric!); 8.1.5; 8.2.16 Worksheet	4/5	4/26
Exam on Mathematical Modeling, Thermodynamics, and Probability on 26 April				
9	Linear Algebra: Vector spaces, linear independence, bases, linear systems, transformations, trace and determinant, matrix inverses, eigenvalues and eigenvectors.	3.2.15, 28, 30, 31; 3.5.7, 8, 16, 17, 18, 20; 3.6.17 Worksheet	4/23	5/24
10	Inner Product Spaces, orthogonality and group structure, the Gram-Schmidt Procedure. Function Spaces, Bessel's and Cauchy-Schwarz inequalities, Fourier series and the solution of partial differential equations.	3.3.1, 8, 13; 3.4.3 (index notation!); 3.5.30; 3.6.14*; 4.1.2 (<i>special</i> unitary); 10.1.13, 14, 15 (<i>A</i> and <i>B</i> Hermitian), 16; 10.2.1, 2; 10.3.3, 5, 8; 14.3.2, 4; 14.4.2(a,b) Worksheet	5/21	TBD
Final Exam on Exam Date				