

PDE Separation-of-Variables Problems in Spherical Coordinates

-1. Test 2: Weds, Nov. 9, 1:30 (OASAEHG)-2:30pm.

- Covers material from Green's functions for ODE BVPs (9.3), separation of variables and eigenfunction expansions for PDEs (2.3, 2.4, 8.2-8.4, 8.6), Helmholtz equations, Bessel functions, multi-dimensional problems (2.5, 7.2-7.10), the material covered on Homeworks 5-8, Lectures 11-26.
- NO Variation of Parameters, NO Green's functions for PDEs, everything else: assume YES.
- As with Test 1, you will be provided with a basic-math summary sheet and you may bring one sheet of notes, no calculators, no books.
- Since PDE separation-of-variables problems can be very long, you will be asked to work out only specific parts of such full problems; follow instructions carefully and provide solutions in the forms specified in the questions.
- Optional review session ???

0. Reading from Haberman: Section 7.10, Sections 9.5.1-6.¹

1. Haberman, page 345, problem 7.10.3dbc.
2. Haberman, page 346, problem 7.10.9bd.
3. Haberman, page 346, problem 7.10.12.

- Background in complex variables is needed to fully understand Fourier and Laplace transforms, so this will be the focus of the next few weeks of the course.

The course will not assume any advanced material not covered in my lectures, but the following list of books on complex variables could be helpful for your additional study as good references to supplement my lecture notes:

- Good inexpensive books
 - * Schaum's Outlines: Complex Variables by M. R. Spiegel
 - * Applied Complex Variables by J. W. Dettman (Dover Inc)
 - * A First Course in Partial Differential Equations: with Complex Variables and Transform Methods by H. F. Weinberger (Dover Inc)
- Thorough intro-level textbooks
 - * Complex Variables and Applications by J. W. Brown and R. V. Churchill
 - * Fundamentals of Complex Analysis with Applications to Engineering, Science, and Mathematics (3rd Edition) by E. B. Saff and A. D. Snider
- Heavy-duty advanced applied complex variables
 - * Complex Variables: Introduction and Applications by M. J. Ablowitz and A. S. Fokas (Cambridge Univ. Press)
 - * Functions of a Complex Variable: Theory and Technique by G. F. Carrier, M. Krook and C. E. Pearson (SIAM)

Some of these books are on reserve in Perkins library.

¹This will not be collected, but you can try it to see if you can solve these basic problems.