Math 418 Review Test I

Chapter 2: Fourier Series 2.1-2.6, 2.8

Definitions- Fourier Series: complex $f(x) = \sum_{n \in \mathbb{Z}} c_n e^{inx}$ with $c_n = \frac{1}{2\pi}\int_0^{2\pi} f(x)e^{-inx}dx$ or real version ... , Partial Fourier series $s_N(x)$, T-Periodic function $f(x) = f(x+T)$, Euler's Formula $e^{ix} = \cos(x) + i\sin(x)$, Parsevals identity (complex and real form), Dirchlet Kernel, orthogonal functions

Theorems: 1-pg 20, prove Dirchlet kernel pg 77-78 or homework, show $\{e^{inx}\}_{n\in\mathbb{Z}}$ is an orthogonal set, show $\{1, \cos(x), \sin(x), \cos(2x), \sin(2x) \dots\}$ is an orthogonal set

Problems: be able to compute Fourier coefficients of simple functions, $f(x) = x$, $g(x) = \cos(2x) \dots$ and set up Fourier series of more complicated functions, be able to apply Parsevals identity to evaluate series, Dirchlet Kernel to compute s_N

Chapter 3: PDE in Rect Coord 3.1, 3.2 3.3 3.5 3.7 3.8 3.9

Definitions- Wave equation in one and two dimensions, Heat equation in one and two dimensions, Laplace's equation Poisson equation, eigenfunctions and eigenvalues of a differential operator.

Problems: be able to use separation of variables and eigenfunction expansions to give series solutions to the PDE's above(Derivations in 3.3, 3.5,3.7,3.8, 3.9)

Important Differential Equations

$$y'' + \alpha^2 y = 0$$

general solutions $y = c_1e^{i\alpha x} + c_2e^{-i\alpha x}$ or $y = d_1\cos(\alpha x) + d_2\sin(\alpha x)$

$$y'' - \alpha^2 y = 0$$

general solutions $y = c_1e^{\alpha x} + c_2e^{-\alpha x}$ or $y = d_1\cosh(\alpha x) + d_2\sinh(\alpha x)$

$$y' = \alpha y$$

general solutions $y = A_0e^{\alpha x}$