

Information for the Math 4354 Final – Fall 2009

The problems listed below are the types found on your sample and in-class exams. The best way to prepare for the final is to practice working problems like the ones listed below from your exams, the book and homework.

Test 1:

1. Find determinant, eigenvalues, eigenvectors for a matrix.
2. Solve IVP for a system of linear equations using eigenvalues and eigenvectors.
3. For nonlinear systems (i) Find the Jacobian; (ii) Find the critical points; (iii) Classify the critical points.
4. Find a Fourier series.
5. Show eigenvalues are negative for

$$\varphi'' = \lambda\varphi, \quad \varphi'(0) - k_0\varphi(0) = 0, \quad \varphi'(\ell) + k_1\varphi(\ell) = 0, \quad k_0, k_1 > 0.$$

6. Show eigenfunctions corresponding to distinct eigenvalues are orthogonal for

$$\varphi'' = \lambda\varphi, \quad \varphi'(0) - k_0\varphi(0) = 0, \quad \varphi'(\ell) + k_1\varphi(\ell) = 0, \quad k_0, k_1 > 0.$$

Test 2:

1. Solve an initial boundary value problem for the heat equation.
2. Solve an initial boundary value problem for the wave equation.
3. Solve a non-homogeneous heat problem and find the steady state solution.
4. Solve a heat equation with non-homogeneous boundary conditions.
5. Solve a Dirichlet problem in the disk.
6. Solve a pde using Laplace transforms.