MA 401 Test 1 Review 1.1-1.3, 1.5, 1.7-1.9

**1.1 PDE Models**
Determine if a PDE is linear/nonlinear, homogeneous/nonhomogeneous
Verify that u is a solution to a PDE
Ex. p. 9-10 #2,3,4,5,7,8 (I wouldn't give you the hint!),9,10

**1.2 Conservation Laws**
Apply the Method of Characteristics
Solve Separable d.e.
Solve 1$^{st}$ Order Linear d.e.
Graph relatively simple Characteristic Curves in the xt-plane, time snapshots in the ux-plane
Know what it means to be a Cauchy problem
Remember and be able to apply Calc 3 Chain Rule
Ex. p.25-26 #2,5,6,8

**1.3 Diffusion**
Compare Advection to Diffusion to Advection-Diffusion graphically
Types of Boundary Conditions (i.e., Dirichlet vs Neumann vs Robin, homogeneous/nonhomogeneous)
Steady state solutions (time independent solutions)
Ex. p. 36-37 #4,5,6

**1.4 Vibrations and Acoustics**
For the most part, we just derived the wave equation in this section
Ex. p. 55 #4

**1.7 Heat Conduction in Higher Dimensions**
We mostly derived Poisson's equation and Laplace's equation in this section
Know what the Laplacian of u is in 2D and 3D
Ex. p. 64 #1

**1.8 Laplace's Equation**
Know the Maximum Principle
Find a radially symmetric solution for Laplace's equation in polar coordinates
Ex. p. 71-72 #1,6

**1.9 Classifications of PDEs**
Classify a PDE as hyperbolic, parabolic, or elliptic
Change variables & solve the PDE
Ex. p. 76-77 #1,2,3,5,6,7