We covered a lot of ground in this class. There is no way that I could cover everything that could be on the exam in two review assignments. So instead of trying to, I’m going to focus on some fundamental things that I have noticed some confusion about. I hope this turns out to be helpful, but remember that this just scratches the surface of what you need to know.

1. (5 points) Consider the complex number \( z = (a + ib)e^{ic} \) where \( a, b, \) and \( c \) are real numbers.
   
   (a) What is the complex conjugate of \( z \)?
   
   (b) What are the real and imaginary parts of \( z \)? Be sure to write them with no \( i \) in them so that it is obvious that your answers are real numbers.
   
   (c) What is the magnitude of \( z \)?

2. (15 points) Solve the following PDE IC/BC problem by the method of separation of variables

   \[
   u_{tt} = c^2 u_{xx}
   \]

   \[
   u(0, t) = 0 \quad u(L, t) = A
   \]

   \[
   u(x, 0) = 0 \quad u_t(x, 0) = B
   \]

   where \( A, B \) and \( c \) are constants. Note that

   \[
   \int_0^b x \sin(ax)dx = \frac{\sin(ab) - ab \cos(ab)}{a^2}
   \]

3. (5 points) Verify that your answer to the last problem satisfies the boundary conditions and solves the PDE, and then plot your solution and the time derivative of your solution at \( t = 0 \) to show that it satisfies your initial conditions.

4. (15 points) Solve the following PDE IC/BC problem by the method of eigenfunction expansion

   \[
   u_{tt} = c^2 u_{xx} + A
   \]

   \[
   u(0, t) = 0 \quad u(L, t) = 0
   \]

   \[
   u(x, 0) = 0 \quad u_t(x, 0) = 0
   \]

   where \( A \) and \( c \) are constants.