

**Math 319 - Differential Equations II**  
**Pre-Reading Assignment # 7**  
**due 10am Tue Oct 7th, via email**

**Instructions:** This pre-reading assignment is designed with the sole purpose of helping you prepare for the midterm. What I'm asking you to do is to go over the sample problems for the midterm, and tell me on what problems you most need further instruction. I will prepare the content of the lecture based on your responses to the questions below.

**Reading** There are two things to read for this pre-reading assignment, both review of material you have learned earlier. The reading is:

1. review of Taylor Series: the appropriate section in your old calculus text or notes (or read the summary here:  
<http://tutorial.math.lamar.edu/Classes/CalcII/TaylorSeries.aspx> )
2. review of solution to nonhomogeneous second order differential equations: pages 1-2 of Lect15.pdf (sent as an attachment)

We will be using both of these concepts in class on Tuesday.

**Questions** The questions below are all very short. If you find yourself writing more than a line or two for each problem, you're likely on the wrong track!

1. Write out the Taylor Series expansion of  $C(x + \Delta x)$  around  $x$ .
2. Write out the Taylor Series expansion of  $C(x - \Delta x)$  around  $x$ .
3. Consider the following heat equation problem:

$$\frac{\partial u}{\partial t} = \beta \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < L, \quad t > 0, \quad (1)$$

$$u(0, t) = U_1, \quad u(L, t) = U_2, \quad t > 0, \quad (2)$$

$$u(x, 0) = f(x), \quad 0 < x < L. \quad (3)$$

- (a) What makes this problem nonhomogeneous?
- (b) We solve this problem by assuming that  $u(x, t) = v(x) + w(x, t)$  (*Don't actually plug this in. Just look at the assumption and think about what it means.*) How is the structure of this solution similar to the solution of a nonhomogeneous second order ordinary differential equation?