

**Math 307 I, Spring 2012**  
**Extra Credit Problem #3**

*This problem is due any time before the final exam, which is on June 5th. Choose **one** of the following sets of challenging book problems, and complete all the problems in that set. Significant credit will only be given if you make a decent attempt on all the problems in your chosen set. However, partial solutions will still be awarded points. You can get up to six points, which will be added to your final exam score (which is out of 100).*

*You are encouraged to ask me for hints. **Warning:** all of these problems are challenging - see that they don't confuse you to the point of jeopardizing your understanding of the course material that matters.*

**1. Laplace Transforms and Special Functions.** These deal with LTs and inverse LTs of some unusual functions, including a generalization of the factorial  $n!$  to all positive real numbers.

Section 6.1 #26, #27

Section 6.2 #27

**2. Laplace Transforms of Periodic Functions.** There is a nice formula for the LT of a function that repeats itself.

Section 6.3 #33, #34, #35, and

Problem A: Find the Laplace Transform, using the result of #34, of the following function.

$$f(t) = \begin{cases} \sin t, & 0 \leq t < \pi \\ \sin t, & \pi \leq t < 2\pi \end{cases} ; \text{ and } f(t + 2\pi) = f(t).$$

(Make sure to use the result of #34.)

**3. Resonance and Beats.** We saw resonance and beats in Section 3.8, talking about sinusoidal forcing functions in nonhomogeneous equations. With nonsinusoidal, yet still periodic, forcing functions, these behaviors appear as well.

Section 6.4 #19, # 20, #23