ECE 202 HW #5
Spring 2007
Due 02/23/07

- Office Hours: MW 3:30-5:00 p.m.
- Read Chapters 9.3, 10.1-10.3 from the book and the lecture notes.

1. [30] Find the inverse Laplace transform for the following functions. Verify your answers using MATLAB symbolic toolbox. Include your code and results.

   a) $F(s) = \dfrac{s+20}{s(s+10)}$

   b) $F(s) = \dfrac{s^2}{(s+5)(s+10)}$

   c) $F(s) = \dfrac{3s^4+10s^2+4}{s(s^2+1)(s^2+4)}$

   d) $F(s) = \dfrac{30(s+2)}{s(s^2+4s+5)}$

   e) $F(s) = \dfrac{(s+40)^2}{(s+10)^2(s+100)}$

2. [20] For a Laplace transform with repeated roots, $F(s) = \dfrac{P(s)}{(s+p_1)(s+p_2)^k}$, the partial fraction expansion is given by

   $\dfrac{k_1}{s+p_1} + \dfrac{a_0}{(s+p_2)^k} + \dfrac{a_1}{(s+p_2)^{k-1}} + ... + \dfrac{a_{k-1}}{(s+p_2)}$, where

   $A_n = \dfrac{1}{n!}\dfrac{d^n}{ds^n}[(s+p_2)^k F(s)]\Big|_{s=-p_2}$. Consider $F(s) = \dfrac{4}{(s+1)(s+2)^3}$.

   a) Find the partial fraction expansion of this Laplace transform using the formula given above and then invert it to get the time domain function.
   b) Repeat part (a) using the method of factoring the repeated poles and doing partial fraction expansions on the remaining simple fractions, as discussed in class.

3. [10] 10.6

4. [20] 10.14

5. [20] 10.18