# Review for Midterm II

Midterm 2 will be on April 13. The sections covered are : $7.1 - 7.5$. I have written some review problems here.

i) Find the Laplace Transform for :

   a) $f(t) = e^{2t} \cos^2 (3t)$

   b) $f(t) = t \sinh (t)$

   c) $f(t) = \frac{1 - \cos (3t)}{2t}$

   d) $f(t) = \begin{cases} 0, & \text{if } 0 \leq t < 2; \\ t, & \text{if } 2 \leq t < 4, \\ 0, & \text{if } 4 \leq t. \end{cases}$

ii) Find the inverse Laplace Transform of :

   a) $F(s) = \frac{1}{s(s^2 + 1)}$

   b) $F(s) = \frac{2s}{s^3 - 3s^2 + 4s}$

   c) $F(s) = \ln \left( \frac{s^2 + 9}{s^2 + 25} \right)$

   d) $F(s) = \frac{s(1 + e^{5s})}{s^2 + 1}$

iii) Solve the following initial value problems :

   a) $x'' + 6x' + 7x = 1$,     $x(0) = x'(0) = 0$.

   b) $x'' - 9x = 2t$,     $x(0) = x'(0) = 0$.

   c) $tx'' + (3t - 1)x' + 3x = 0$,     $x(0) = 0$.

   d) $x'' + 4x' + 5x = f(t)$,     $x(0) = x'(0) = 0$ and $f(t) = \begin{cases} 1, & \text{if } 0 \leq t < 2; \\ 0, & \text{if } 2 \leq t. \end{cases}$

In addition, you can look at several of the problems given in the book which are similar to your homework problems.

You have to memorize the table of Laplace transforms. It would really be difficult for you to complete the exam in time if you attempt to derive the formulae at the last minute.