Homework Assignment 7 in MATH 308-SPRING 2015 **due February 25, 2015**

Topics covered : *method of reduction of order; nonhomogeneous equations and method of undetermined coefficients (corresponds to sections 3.4, and 3.5 in the textbook).*

1. Given the solution $y_1(t) = t^{-1/2}$ of the differential equation $4t^2y'' - 4ty' - 5y = 0, \quad t > 0$. Use the method of reduction of order to find a second solution $y_2(t)$ of this equation such that $\{y_1(t), y_2(t)\}$ is a fundamental set of solutions on $t > 0$.

2. (a) For each of the following equations write down the form in which a particular solution should be found according to the method of undetermined coefficients (**you do not need to find the value of the undetermined coefficient/coefficients here**):

   i) $3y'' + 5y' - 2y = 7e^{2t}$;

   ii) $3y'' + 5y' - 2y = 7e^{-2t}$

   iii) $3y'' + 5y' - 2y = 3e^{2t}\cos 10t$;

   iv) $3y'' + 5y' - 2y = 7e^{-2t}\cos 3t$;

   v) $4y'' - 4y' + y = 5e^{3t}$;

   vi) $4y'' - 4y' + y = 5e^{t/2} - 2e^{t/2}\sin 3t$;

   vii) $y'' + \omega_0^2 y = \cos\omega t + 2\sin\omega t$ (consider separately the case $\omega^2 \neq \omega_0^2$ and the case $\omega^2 = \omega_0^2$);

   viii) $18y'' + 30y' + 17y = e^{-5t/6}\left(\cos(\frac{t}{4}) - 2\sin(\frac{t}{4})\right)$.

   (b) Find the general solution for equation in the item (a) iii);

   (c) Find the general solution for equation in the item (a) vii) (consider separately the case $\omega^2 \neq \omega_0^2$ and the case $\omega^2 = \omega_0^2$).