Math 245-Fall 2019

HW#4-Due: Wednesday, Jan.8, 2019, 12:30 (Final Exam at RA 04)

**Late HW's will not be accepted! 20% of the Final Exam grade will be from HW#4.

PLEASE SOLVE EACH PROBLEM ON A SEPARATE PAPER AND IN THE GIVEN ORDER!!!

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1) Using power series solution (only this method is accepted, any other solution method will receive NO CREDIT!!!);

a) Solve the d.e.: $(x-1)y'' + 2y = 0$ around $x_0 = 0$.

b) Solve the I.V.P.: $(3-x^2)y'' - 3xy' - y = 0, \quad y(0) = 1, \quad y'(0) = 2$

(In both of the problems above; first verify that $x_0 = 0$ is an ordinary point.
In the general solution, $y_g(x) = Ay_1(x) + By_2(x)$, find the closed forms (find general formulae for a_n's) for both $y_1(x)$ and $y_2(x)$, clearly identifying $y_1(x)$ and $y_2(x)$ in the final solution.)

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2) Given that $y_1 = 5t - 1$ and $y_2 = e^{-5t}$ are linearly independent solutions of the corresponding homogeneous equation, **find the general solution** of:

$$ty'' + (5t-1)y' - 5y = t^2 e^{-5t}, \quad t > 0$$

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3) Solve the following I.V.P. using Laplace transform (ONLY!):

$$ty'' + y' = t, \quad y(0) = 0, \quad y'(0) = 0$$

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4) Find the Inverse Laplace transform of the followings:

a) $F(s) = \frac{s-1}{2s^2+s+6}$

b) $G(s) = \frac{1}{(s+1)^2}$

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5) Solve the d.e.: $y'' + y = tan^2 x$

GOOD LUCK☺