MAP 2302 (Differential Equations)
TEST 2, Friday March 9, 2018

Name: **PID:**

Remember that no documents or calculators are allowed during the test. You must show all your work to deserve the full credit assigned to any question. 3 pages.

1.[10] a) Show that the two functions e^x and xe^{-x} are linearly independent on the interval $(-\infty, 0]$.

b) Given that 0,0,0,3,1-2i,1+2i,1-2i,1+2i,1+$\sqrt{2}$,1-$\sqrt{2}$, 9i, -9i are the roots of the auxiliary equation corresponding to some 12th-order homogeneous linear differential equation with constant coefficients, write down the general solution of the differential equation.

2. [10] Transform the Cauchy-Euler equation: $-3x^2y'' + 7xy' - 5y = 12x^3, \quad x > 0$, into a differential equation in the variable t by setting $x = e^t$. You must show all the steps, but do not solve the differential equation in the variable t.

3. [20] Use the method of undetermined coefficients to solve the differential equation: $y'' + 9y = 3x^2 - 4x$.

4. [20] Use the variation of parameters method to solve the differential equation:
$$y'' - 2y' + y = \frac{e^x}{1+x^2}$$