KFUPM, DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH 202 : TEST 3, SEMESTER (152), MARCH 24, 2016

Name : ....

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Exercise 1.

(a) Verify that
$$[\cosh(x)]^3 = \frac{1}{4}\cosh(3x) + \frac{3}{4}\cosh(x).$$

(b) Let L be a linear differential operator such that y_{p_1} and y_{p_2} are particular solutions of $L(y) = \cosh(3x)$ and $L(y) = \cosh(x)$, respectively. Find a particular solution of the DE : $L(y) = [\cosh(x)]^3$.

Exercise 2. Without solving the differential equation, verify that

$$y = c_1 e^{2x} + c_2 e^{3x} + x^2$$

is the general solution of the DE :

$$y'' - 5y' + 6y = 6x^2 - 10x + 2.$$

Exercise 3. Show that the functions

$$f_1 = e^x,\ f_2 = xe^x,\ f_3 = x^2e^x$$

are linearly independent on $I = \mathbb{R}$.

Exercise 4. Find a differential equation with general solution :

$$y = c_1 e^{2x} + c_2 e^x \cos(x) + c_3 e^x \sin(x) + c_4 x e^x \cos(x) + c_5 x e^x \sin(x) + x^2,$$

where c_1, c_2, c_3, c_4 and c_5 are real parameters.

Exercise 5. Consider the following differential equation :

$$2t^2y'' + 3ty' - y = 0.$$

Given that $y_1 = t^{-1}$ is a solution of the DE ;

(a) find a suitable transformation to reduce the DE to a first order DE.

(b) find all solutions to the DE.