King Saud University,
College of Sciences
Mathematical Department.

Mid-Term2 /S2/2019
Full Mark:25. Time 1H30mn
Math 204 21/03/2019

Question 1[4,4] a) Find the largest local interval for which the following initial value problem has a unique solution

$$\begin{cases} (x^2-9)y'' + y\sec x = e^x \\ y(2) = 1,\ y'(2) = 0. \end{cases}$$

b) By using the method of undetermined coefficients, find only the form of the particular solution of the differential equation

$$y^{(6)} - y'' = 6 + 5e^{-x} + 3x^2\cos x + 7\sin(10x)$$

Question 2 [4,3]. a) Solve the initial value problem

$$\begin{cases} 5y'' - y' = e^x \\ y(0) = 0,\ y'(0) = 1 \end{cases}$$

b) Determine whether the functions

$$f_1(x) = \cos(2x - 1440), \quad f_2(x) = 4\cos 2x, \quad f_3(x) = 2\sin 2x,$$

are linearly independent or linearly dependent on $(-\infty, \infty)$.

Question 3 [5] Find the general solution of the differential equation

$$xy'' + y' = 12\ln x, \qquad x > 0.$$

Question 4 [5] Solve the following linear system of differential equations for $x(t)$ only.

$$\begin{cases} x' + y' = 7x - 3y \\ -2x + y' = e^t \end{cases}$$