King Saud University,
College of Sciences
Mathematical Department.

Mid-Term1 /S1/2018
Full Mark:25. Time 1H30mn
18/10/2018

Question 1[5]. Find and sketch the largest local region of the $xy-$plane for which the initial value problem

$$\begin{cases} \sqrt{y^2-4}dy-(x-y)^2\ln x dx=0 \\ y(2)=-3, \end{cases}$$

has a unique solution.

Question 2[4+4]. **a)** Solve the initial value problem

$$\begin{cases} \frac{dy}{dx}=\frac{y}{x}(\ln x-\ln y), \quad x>0,\ y>0. \\ y(1)=1. \end{cases}.$$

b) By using an appropriate substitution, solve the differential equation

$$2xe^{2y}\frac{dy}{dx}=3x^4+e^{2y}, \quad x>0$$

Question 3[4+4]. **a)** Solve the differential equation

$$2y+2x^2y^2+(x+x^3y)\frac{dy}{dx}=0, \quad x+x^3y\neq 0.$$

b) Find the general solution of the differential equation

$$(2x^{-1}y^{3l2}-x^{-2}e^x)dx+\sqrt{y}dy=0, \quad x>0, \quad y>0.$$

Question 4[4]. The population of a town is doubled in 5 years and became 20000 in 10 years. What is the initial population if the rate of growth of population is proportional to the population at that instant.