Worksheet #2
Date : 24/01/2024 **Name:** _____
MTH204: ODEs/PDEs
Semester: Winter 2024 **Section:** _____

Problem 1. Find the general solution of

$$e^{3\theta}(dr + 3rd\theta) = 0.$$

Problem 2. Find the general solution of

$$ydx + (y + \tan(x + y))dy = 0$$

knowing that $\cos(x + y)$ is an integrating factor.

Problem 3. Find the general solution of

$$2\cosh(x)\cos(y)dx = \sinh(x)\sin(y)dy.$$

Problem 4. Solve the ODE

$$xy' = 2y + x^3e^x$$

Problem 5. A model for the spread of contagious diseases is obtained by assuming that the rate of spread is proportional to the number of contacts between infected and non-infected persons, who are assumed to move freely among each other. Set up the model. Find the equilibrium solutions and indicate their stability or instability. Solve the ODE. Find the limit of the proportion of infected persons as $t \to \infty$ and explain what it means.

Problem 6. The lines of electric force of two opposite charges of the same strength at $(-1, 0)$ and $(1, 0)$ are family of circles given by

$$x^2 + (y - c)^2 = 1 + c^2$$

Show that the equipotential lines (which are orthogonal trajectories of those circles) are the circles given by

$$(x - k)^2 + y^2 = k^2 - 1.$$

Problem 7. Does the initial value problem $(x-2)y' = y, y(2) = 1$ have a solution? Does your result contradict our present theorems?