MATH 246 GROUP WORK 2
11 SEPT 2020, INSTRUCTOR: RUIWEN SHU

Each group only needs to submit ONE file containing your solutions!

Problem 1. The ODE

$$\frac{\mathrm{d}y}{\mathrm{d}t} = t^2(y+1)$$

is linear, as well as separable.
(1) Find the general solution by the method for linear equations.
(2) Find the general solution by the method for separable equations.
(3) Explain why the answers to (1) and (2) are equivalent.

Problem 2. Solve the initial value problem

$$\frac{\mathrm{d}x}{\mathrm{d}t} + e^{-x}t = t, \quad x(2) = 1$$

What is the interval of definition of this solution?

Problem 3. Consider the autonomous ODE

$$\frac{\mathrm{d}y}{\mathrm{d}t} = g(y) = y^3 - y$$

(1) Draw the phase portrait and determine the stability of the stationary points.
(2) At a stationary point y_0, what is the relation between $g'(y_0)$ and the stability of y_0? Try to explain why your conclusion is true.