MATH 246 GROUP WORK 1
4 SEPT 2020, INSTRUCTOR: RUIWEN SHU

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

Problem 1. Given the following differential equations:

$$\text{(a): } \frac{\mathrm{d}^2x}{\mathrm{d}t^2} + x^3 = \sin t, \quad \text{(b): } \partial_t u + \partial_x u = t^2, \quad \text{(c): } x''' + x \cdot x'' = 0, \quad \text{(d): } \frac{\mathrm{d}y}{\mathrm{d}x} + x^3 = x$$

Answer the following questions and briefly explain:
(1) Which equations are ODEs?
(2) Which equations are linear equations?
(3) Which equations are second order equations?

Problem 2. What is the interval of definition of the solutions to the following initial value problems?

$$\text{(a): } x' + \frac{t}{1-t} = 0, \quad x(0) = 0$$

$$\text{(b): } x' + \frac{t}{1-t} = 0, \quad x(2) = 0$$

$$\text{(c): } x' + \frac{x}{t^2-4} + \ln(t+1) = 0, \quad x(0) = 3$$

Problem 3. Find the solution to the following initial value problem:

$$y' + 2y + e^t = 0, \quad y(1) = -2$$

Problem 4. Find the general solution to the following ODE:

$$y' + \frac{y+1}{t} = t$$