

DIFFERENTIAL EQUATIONS (751873001, 113-1) - HOMEWORK 2

Return by October 10, 2024 (Thursday) 23:59

Total marks: 50

Special requirement. All homeworks must be prepared by using L^AT_EX.

Exercise 1 (10 points). Find the general solution of

$$\frac{du}{dt} = \frac{3t^2 + 4t + 2}{2(u - 1)}.$$

Exercise 2 (10 points). Find the general solution of

$$\frac{du}{dt} = \frac{4t - t^3}{4 + u^3}.$$

Exercise 3 (10 points). Given any $f \in C^1(\mathbb{R})$, solve the equation $(1 + t^2)\partial_t u + \partial_x u = 0$ with $u(0, x) = f(x)$ and identify the range of x .

Exercise 4 (10 points). Given any $f \in C^1(\mathbb{R})$, solve the equation $t\partial_t u + x\partial_x u = 0$ with $u(0, x) = f(x)$ and identify the range of x .

Exercise 5 (10 points). Solve the equation $x\partial_t u + t\partial_x u = 0$ with $u(0, x) = e^{-x^2}$.