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Advanced Numerical Methods. Exercise 1.

Exercise 1 (5 Points)

Give all solutions to the ODE

$$y' = \frac{1}{x}y.$$

Exercise 2 (10 Points)

Solve the initial value problem

$$y' = 1 + y^2, \quad y(0) = 0.$$

Exercise 3 (15 Points)

Solve the ODE

$$y' = \frac{1}{x}y + \frac{1}{y}.$$

and draw different solutions in a diagram. Also indicate the corresponding vector field in your drawing. Hint: Substitute $u(x) = \frac{y(x)}{x}$