

First Order Differential Equations

Objectives

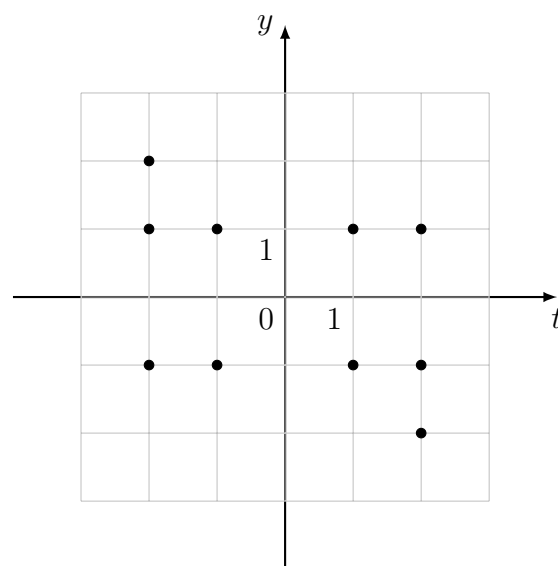
- Students should be able to sketch a direction field of a given a first order differential equation.
- Student should be able to identify the type of differential equation between separable equations and Euler Homogeneous equations.
- Students should be able to find solutions to the above types of equations.

Recitation Worksheet Problems: Sections 1.3, 1.4

- (1) Sketch segments from the slope field for the differential equation

$$y' = y + t.$$

at the points indicated on the figure below.



- (2) Identify the **differential equation** that produces the slope field below.

(A) $y' = 1 - 2y$

(B) $y' = y + 2$

(C) $y' = -(y + 2)$

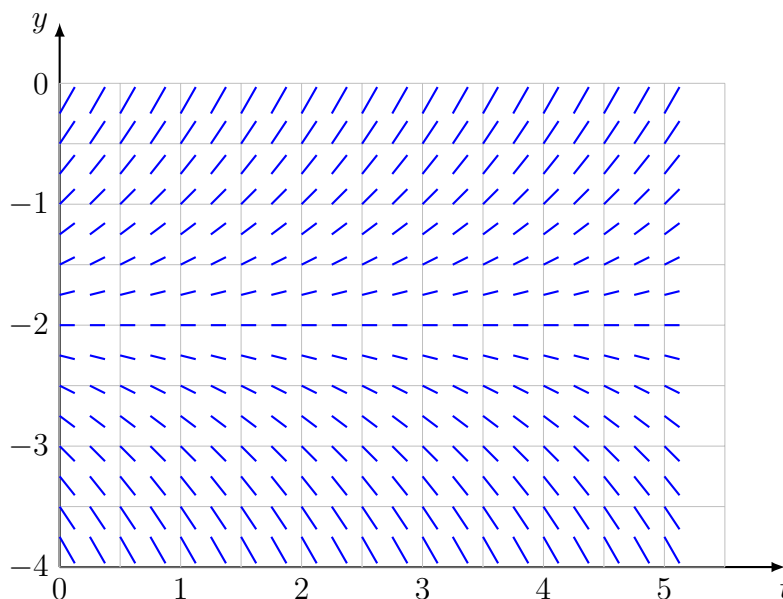
(D) $y' = y - 2$

(E) $y' = 1 + 2y$

(F) $y' = 2 - y$

(G) $y' = y^3$

(H) None of the above.



(3) Consider the initial value problem for the function $x(t)$ given by

$$x' = \frac{t^2}{x + t^3x}, \quad x(0) = -2, \quad t \geq 0.$$

(3a) Find an **implicit** expression of all solutions of the **differential equation** in the form $\psi(t, x) = c$, where c collects all constant terms.

(3b) Find the **explicit** expression of the solution $x(t)$ of the **initial value problem** above.

(4) Find all implicit solutions, $\psi(t, y(t)) = c$, with c constant, to the following differential equation.

$$y' = \frac{t + y}{t - y}, \quad t > 0.$$