

# MATH 319, Fall 2013, Assignment 1

## Textbook Questions

**Section 1.1** Draw a direction field for the given differential equation. Based on the direction field, determine the behavior of  $y$  as  $t \rightarrow \infty$ . If the behavior depends on the initial value of  $y$  at  $t = 0$ , describe the dependency.

# 4  $y' = -1 - 2y$

# 14  $y' = y(y - 2)^2$

**Section 1.1, #22** A spherical raindrop evaporates at a rate proportional to its surface area. Write a differential equation for the volume of the raindrop as a function of time.

**Section 1.2, #5 Undetermined Coefficients.** Here is an alternative way to solve the equation

$$dy/dt = ay - b. \quad (1)$$

(a) Solve the simpler equation

$$dy/dt = ay. \quad (2)$$

Call the solution  $y_1(t)$ .

(b) Observe that the only difference between (1) and (2) is the constant  $-b$ . Therefore it may seem reasonable to assume that the solutions of these two equations also differ only by a constant. Test this assumption by trying to find a constant  $k$  such that  $y = y_1(t) + k$  is a solution of (1).