

# Slope Fields

**Goal:**

- Can sketch a rough slope field by hand
- Can use technology to draw slope fields and predict solutions to differential equations.

**Terminology:**

- Slope field

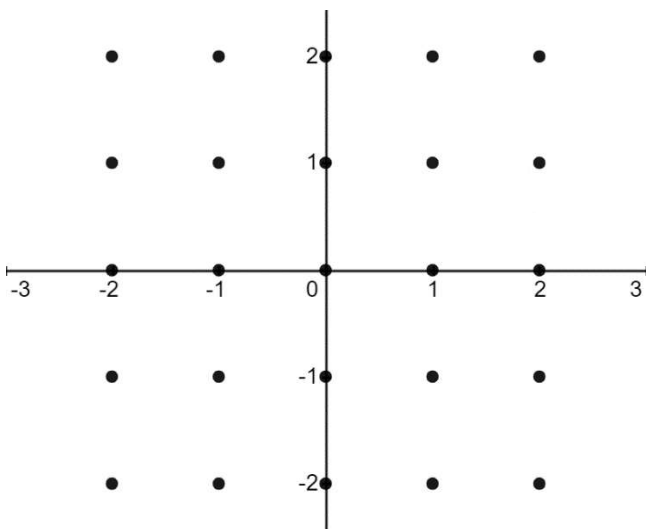
**Discussion question:** What would the solution curve  $y(x)$  look like if  $y(0) = 0$

$$\frac{dy}{dx} = y - x$$

If we are given a differential equation, we can still guess what the solution curve will look like and even make predictions about future values despite not being able to solve the differential equation at times. This is the power of **slope fields**.

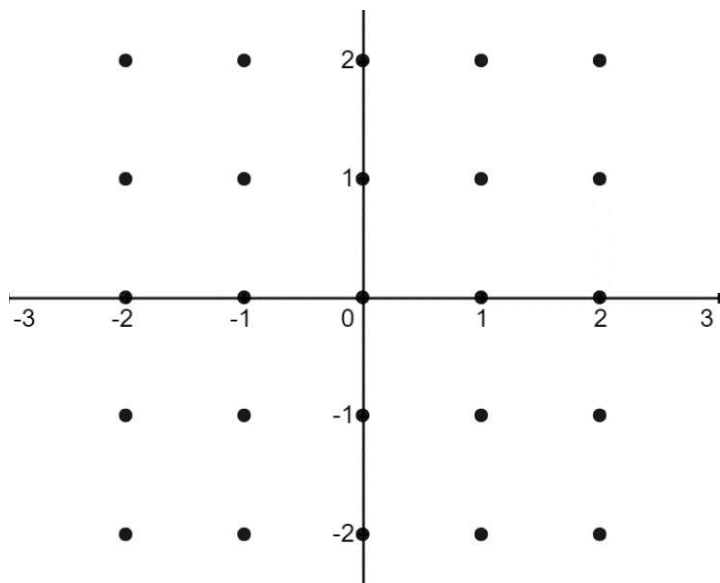
**Example:** Determine the solution to the following differential equation and graph the slope field.

$$\frac{dy}{dx} = x + 1$$



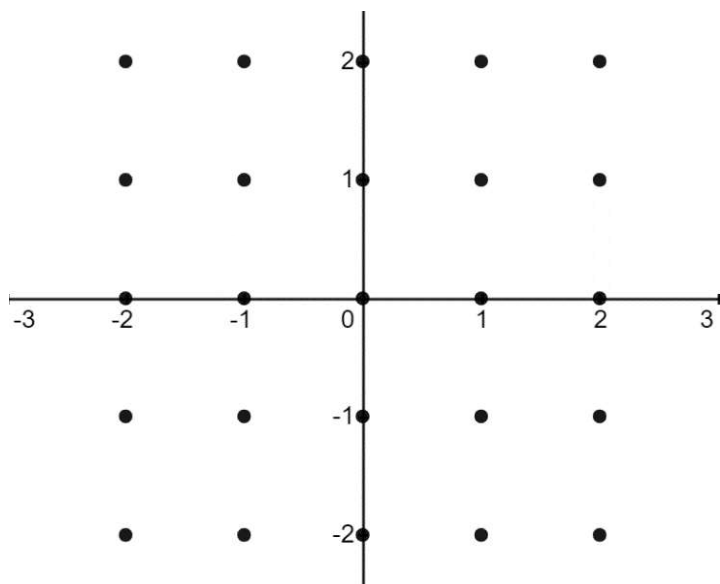
**Example:** Graph the slope field for the following differential equation and predict  $y(2)$  if  $y(0) = 0$

$$\frac{dy}{dt} = y^2 - 1$$



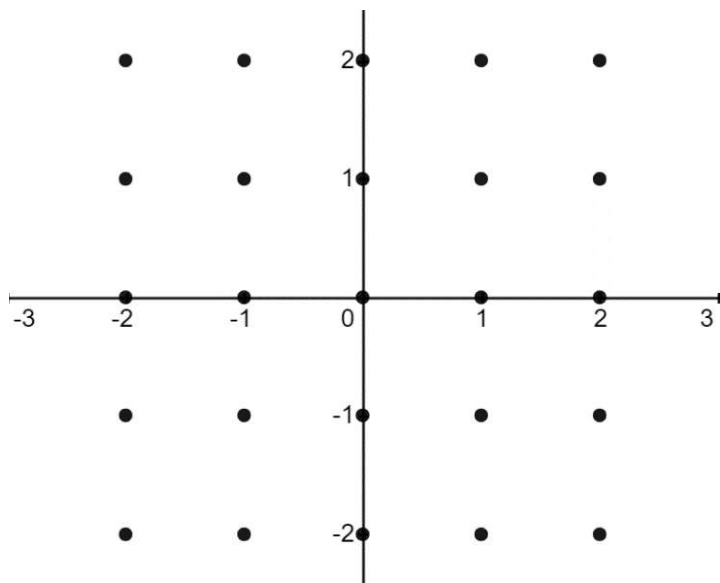
**Example:** Graph the slope field for the following differential equation and predict  $y(2)$  if  $y(-1) = 1$

$$\frac{dy}{dx} = -xy$$



**Practice:** Graph the slope field for the following differential equation and predict  $y(2)$  if  $y(0) = -2$

$$\frac{dy}{dx} = e^{x-y}$$



**Practice:** Graph the slope field for the following differential equation and predict the value of  $y(2)$  if  $y(0) = 1$   
OR  $y(0) = -0.5$

$$\frac{dy}{dt} = y(y - 2)(y + 1)$$

