Daily Quiz

- Go to Socrative.com and complete the quiz.
- Room Name: HONG5824
- Use your full name.

7.2 Visualizing Differential Equations

- A differential equation is an equation that contains an unknown function and one or more of its derivatives.

$$\frac{dP}{dt} = kP$$

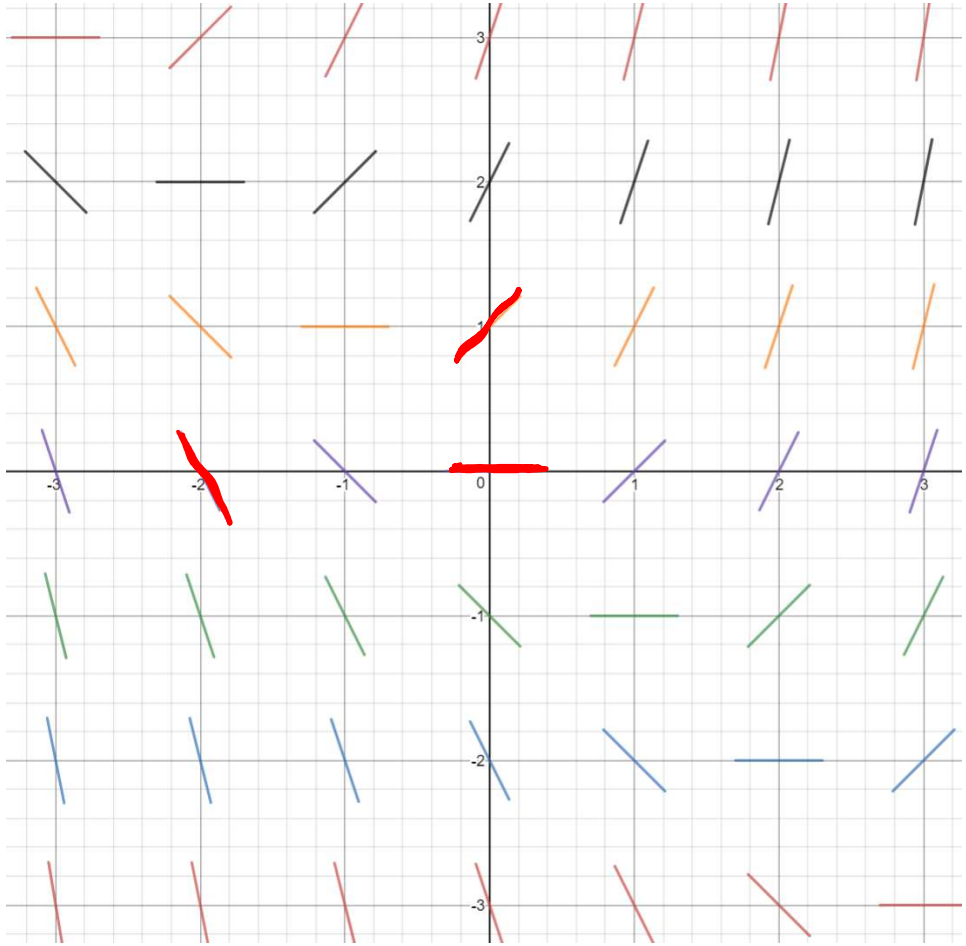
- A Slope Field is the graph of the derivative as a collection of slopes.
- Note: A slope field is also called a Direction Field.

Slope Field Generator: https://www.desmos.com/calculator/2zqmtz0hbk

7.2 Manually Computing Slope Fields

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

x	y	dy/dx
0	0	0
0	1	1
-2	0	-2
-0.1	$\sqrt{2}$	

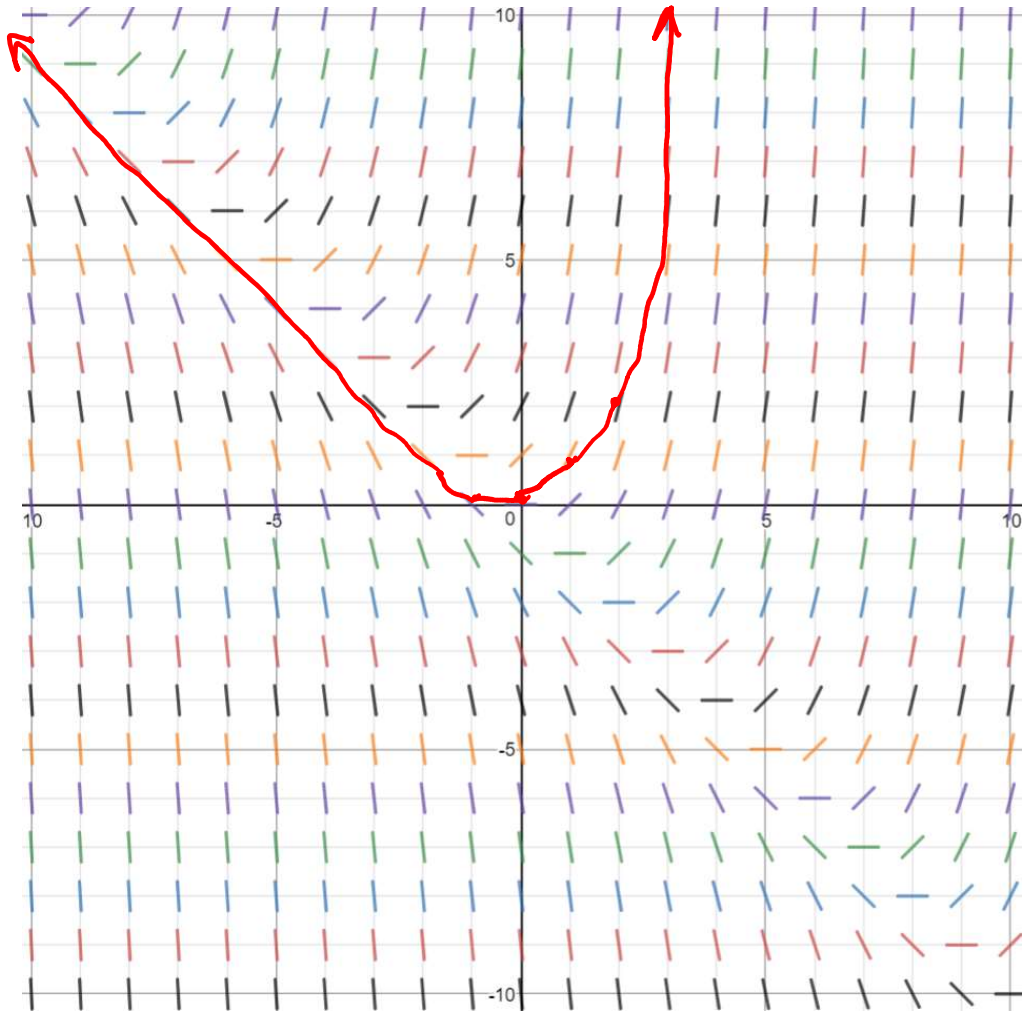


7.2 Slope Fields

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

Sketch the **solution curve** that passes through (1,1).

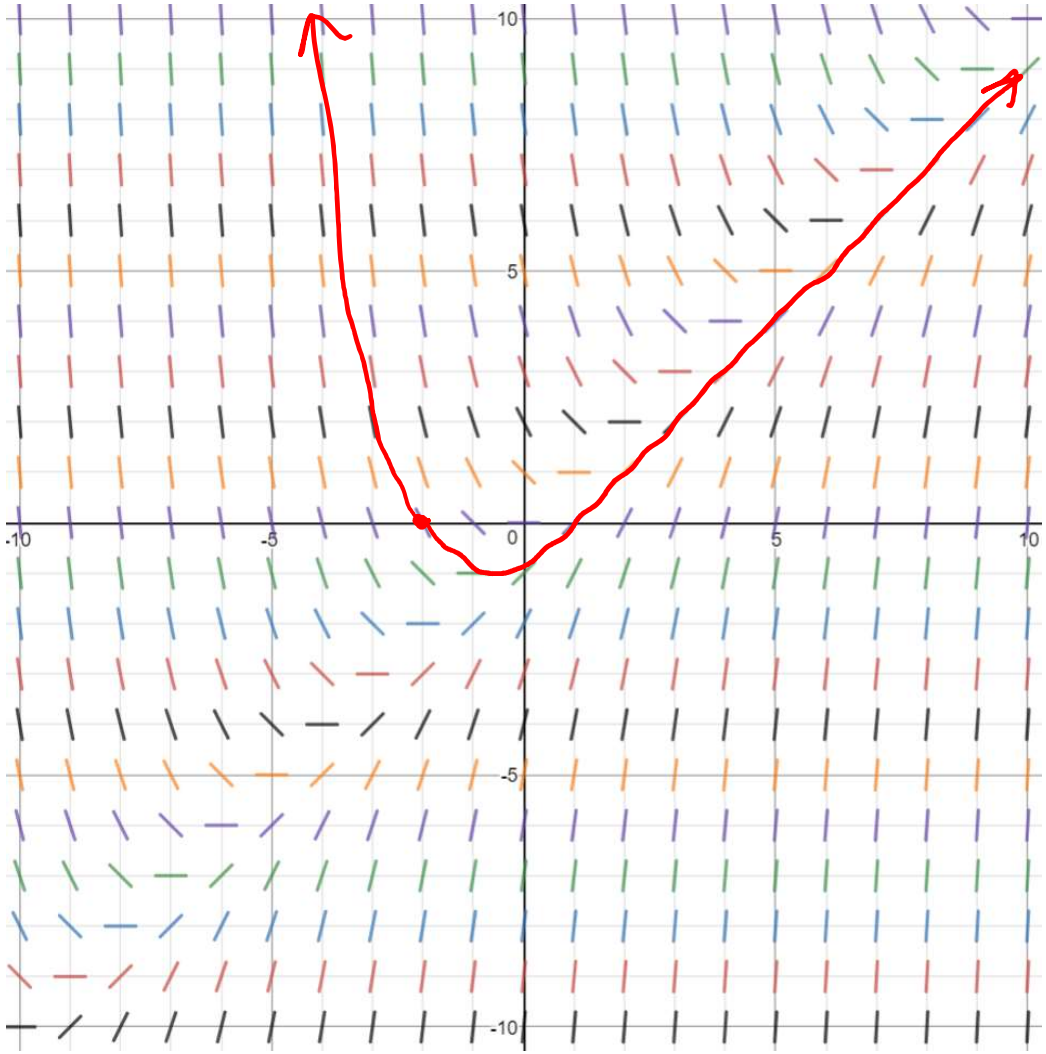
- A solution curve to a differential equation is a path traced out by the lines of the slope field.
- If the slope field represents a river's water currents, a solution curve represents a paper boat's path as it moves along with the current given its initial location.



7.2 Slope Fields

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

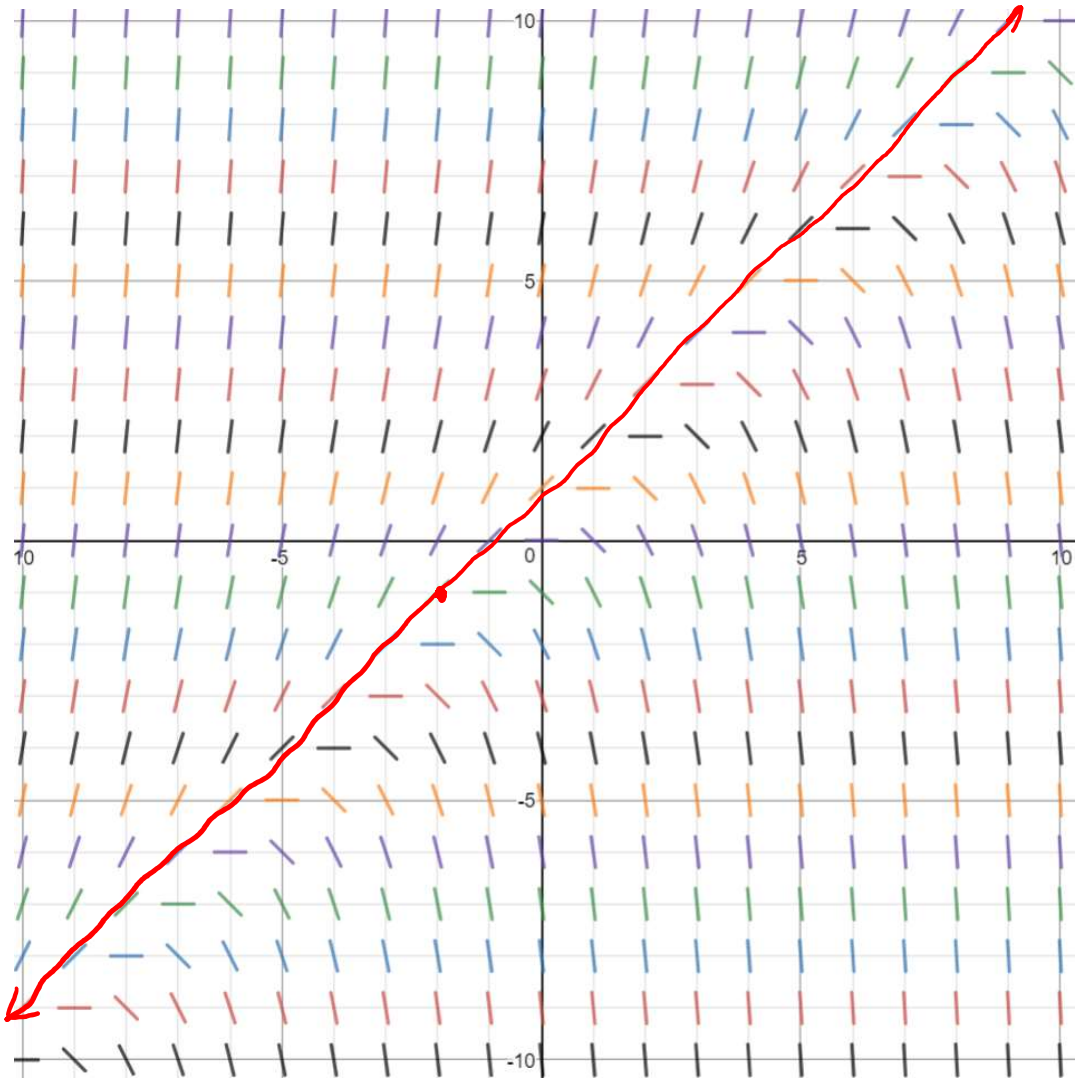
Sketch the **solution curve** that passes through (-2,0).



7.2 Slope Fields

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

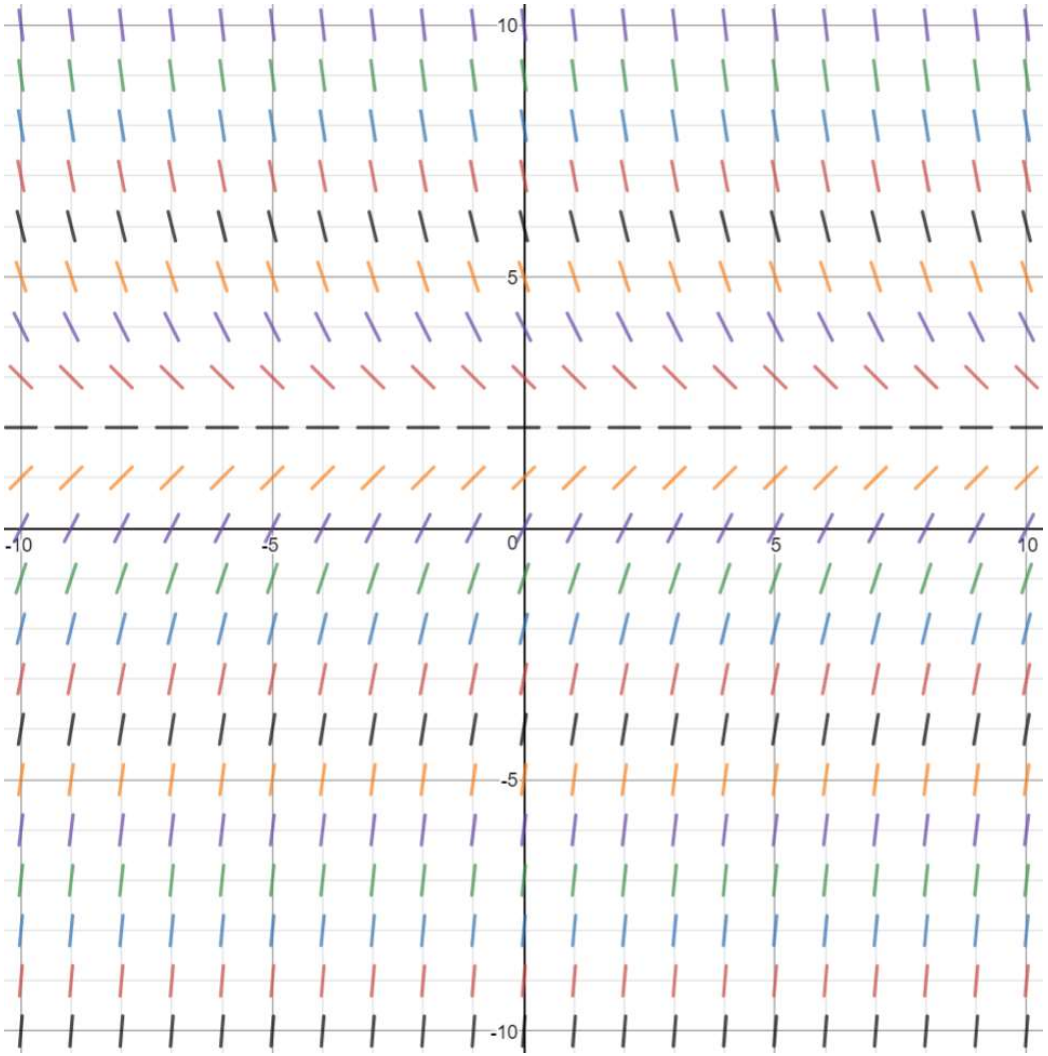
Sketch the **solution curve** that passes through (-2,-1).



7.2 Slope Fields

$$\frac{dy}{dx} = 2 - y$$

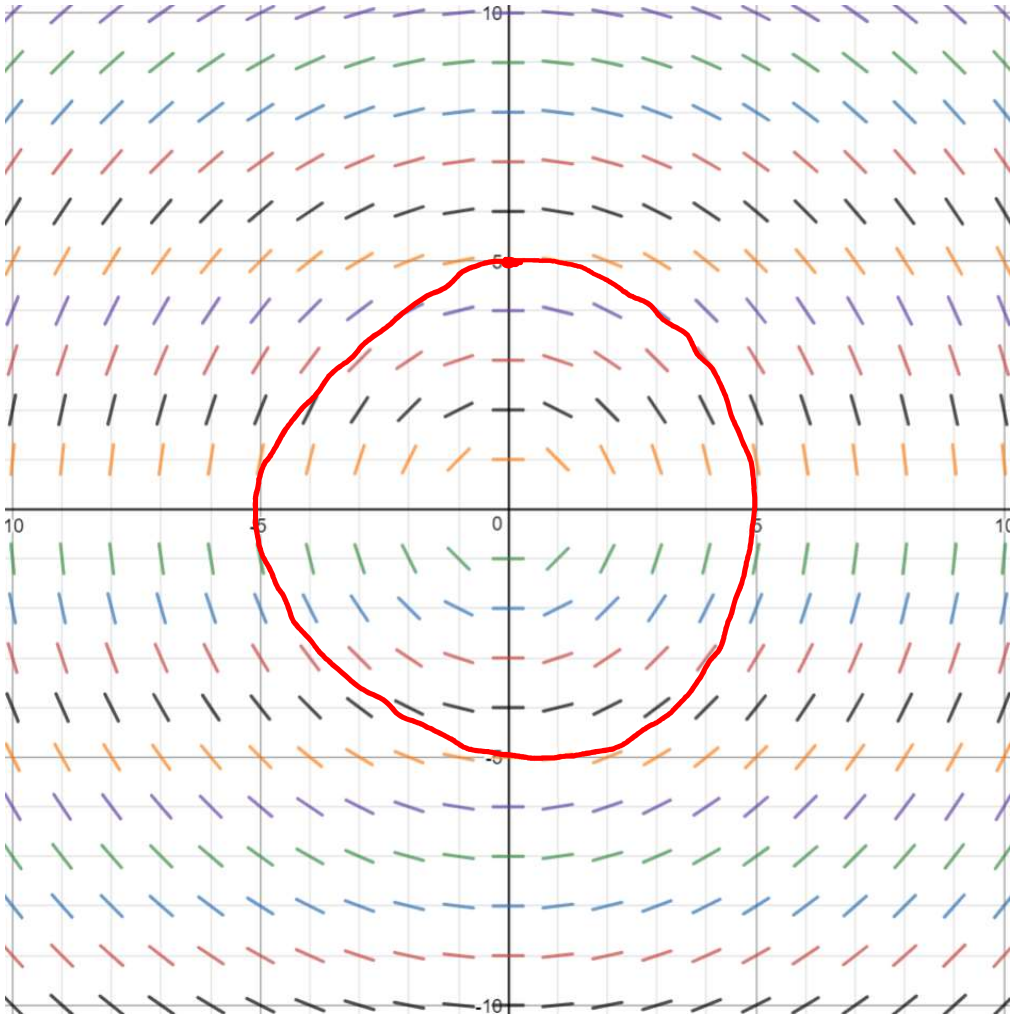
- The constant-valued solutions are called equilibrium solutions
- A differential equation of the form $\frac{dy}{dx} = f(y)$ in which the independent variable is missing from the right side, is called **autonomous.**
- We can obtain infinitely many other solutions of an autonomous differential equation by just shifting the graph of one solution to the right or left.



7.2 Slope Fields

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

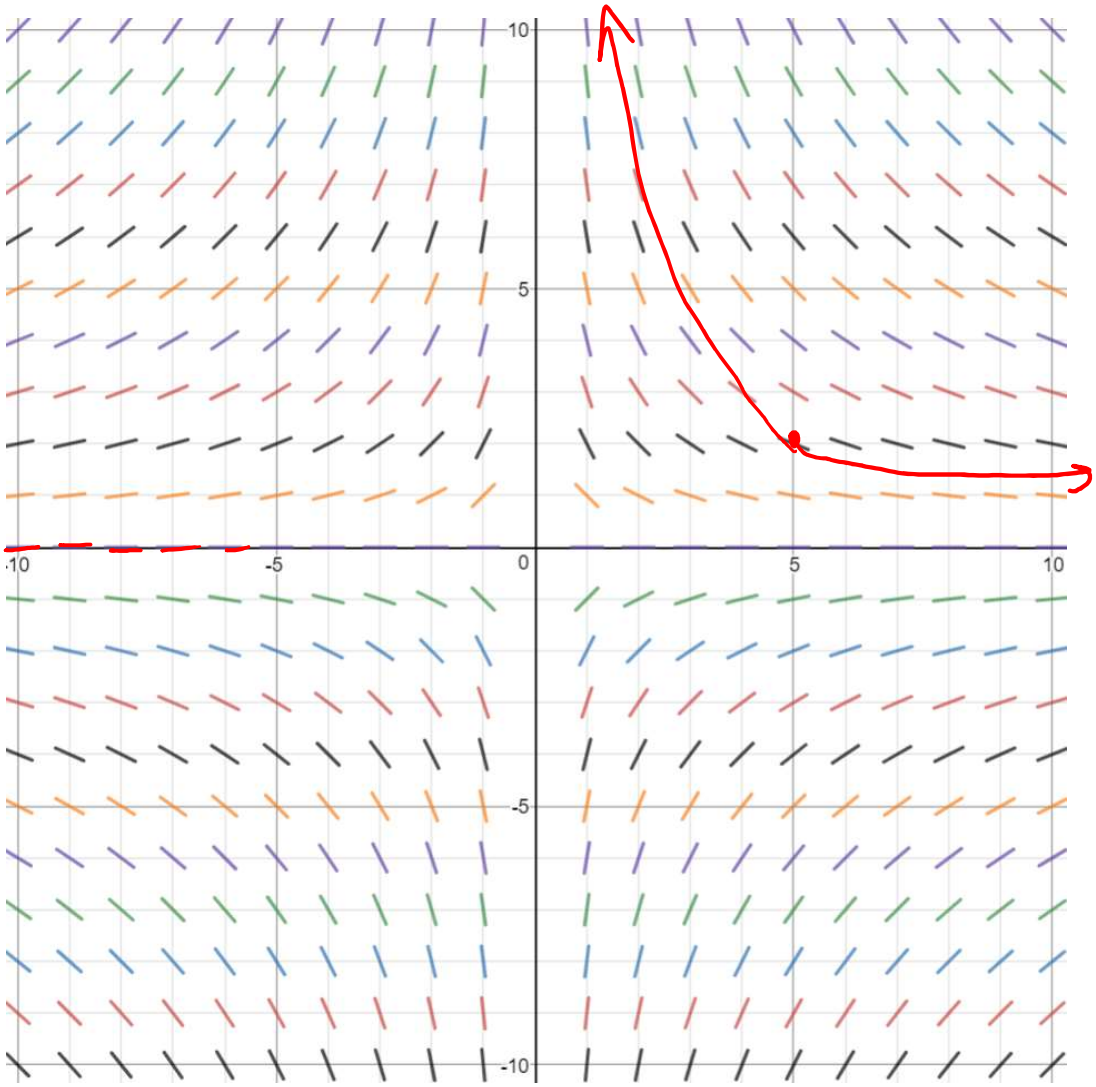
Sketch the **solution curve** that passes through (0,5).



7.2 Slope Fields

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

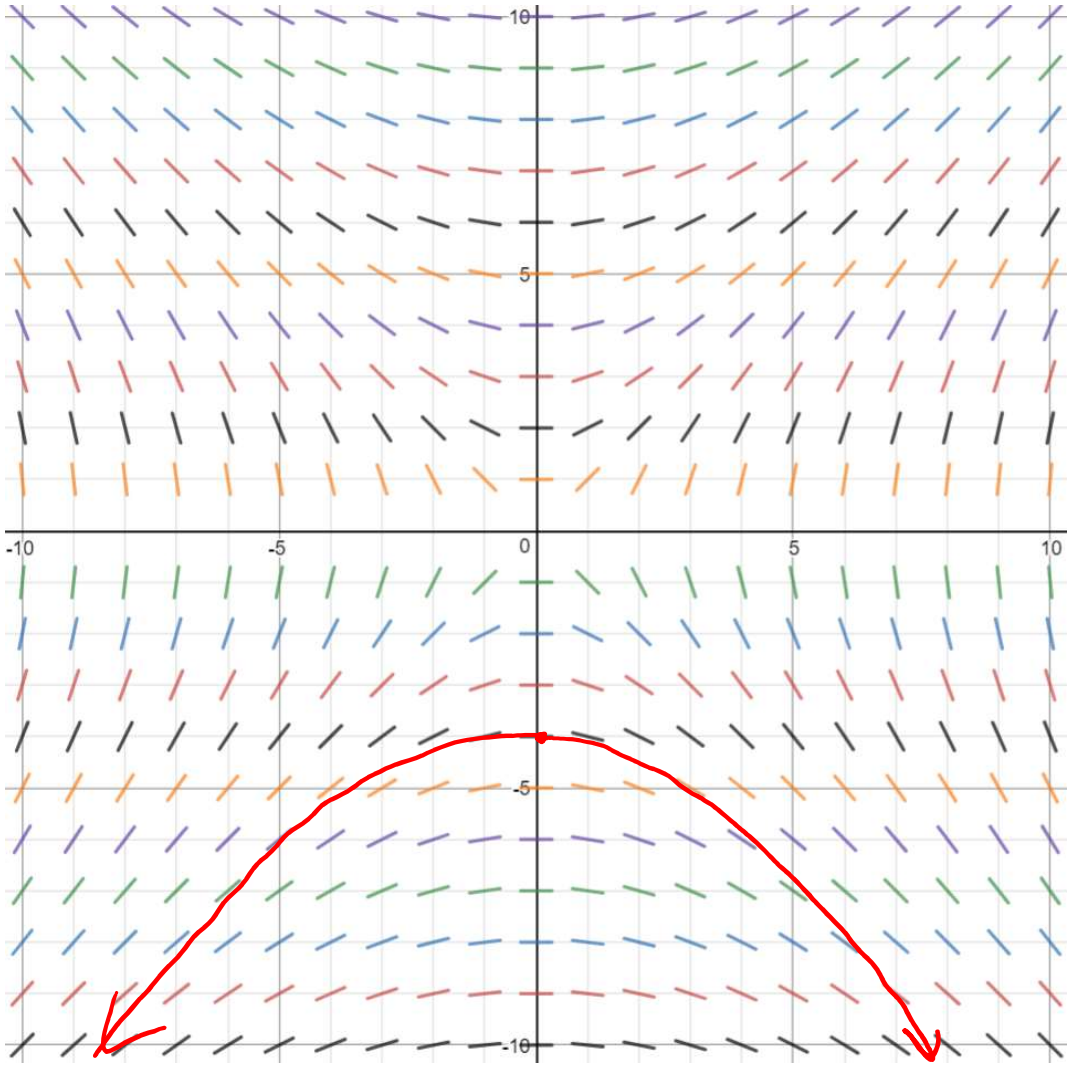
Sketch the **solution curve** that passes through (5,2).



7.2 Slope Fields

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

Sketch the **solution curve** that passes through (0,-4).



7.2 Slope Fields

$$\frac{dy}{dx} = 0.25y(4-y)$$

- How many equilibrium solutions do you see?
- Can you identify the equilibrium solutions from just the differential equation?
- The solution y=4 is a stable equilibrium solution.
- The solution y=0 is an unstable equilibrium solution.