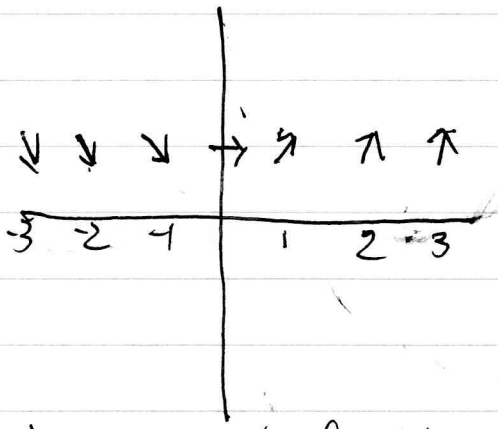
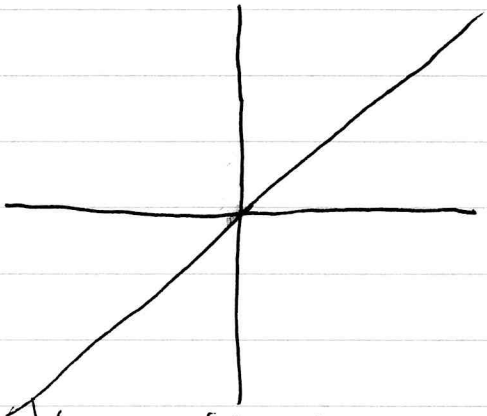
Unit 1 Lesson 3 Notes: Geometric Methods

- A direction field is a representation of the derivative of a function; for example, when ~~$y' = f(x,y)$~~ and $\frac{dy}{dx} = 2x$, we have field



- An isocline is a graph of $y' = f(x,y) = m$; for example, $y' = $ ~~$f(x,y)$~~ $= \frac{dx}{dx} = x - y = 0$ has isocline

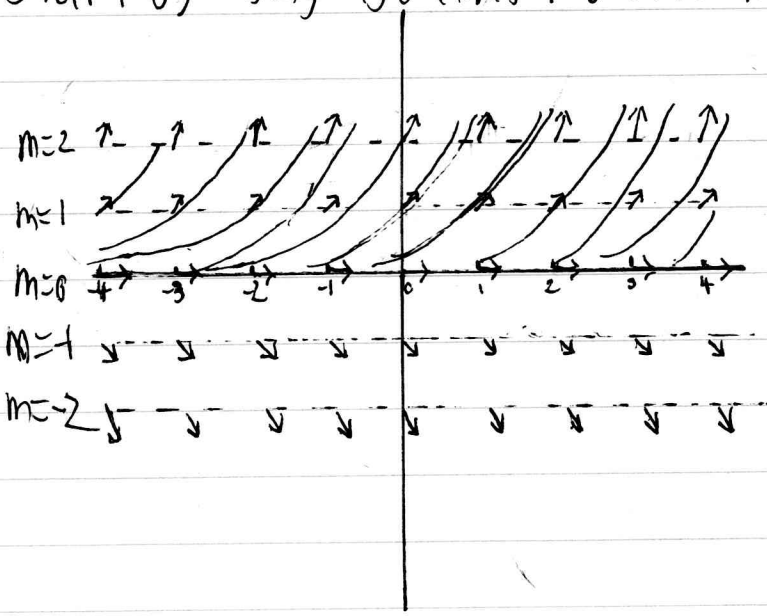


also called the null cline.

- Integral curves are the potential ~~solution~~ solutions to $y' = f(x,y)$

Unit 1 Lesson 3 Isoclines Problem: Geometric Methods

Let us start by using isoclines to draw the direction field,



Mirror across X

There are three; upwards, horizontal, and downwards

Unit 1 Lesson 3 Notes: Geometric Methods

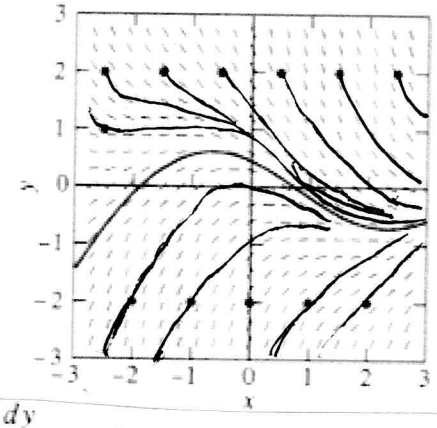
- For any (a,b) in the region where f is defined, $y' = f(x,y)$ has exactly one solution such that $y(a) = b$

- Integral curves cannot intersect

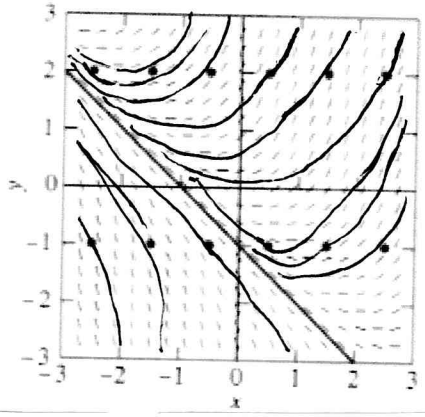
Unit 1 Lesson 3 Problems: Geometric Methods

In Problems 1 through 10, we have provided the slope field of the indicated differential equation, together with one or more solution curves. Sketch likely solution curves through the additional points marked in each slope field.

1. $\dfrac{dy}{dx} = -y - \sin x$



2. $\dfrac{dy}{dx} = x + y$



3. $\dfrac{dy}{dx} = y - \sin x$