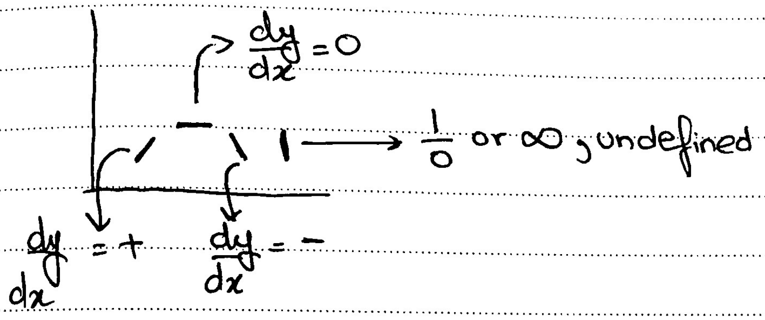
11.2 : Slope fields

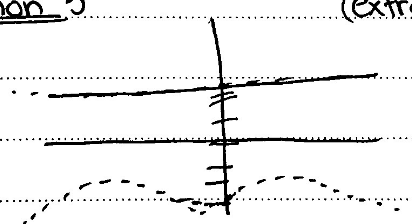
Webwork discussion

- you do not necessarily need to solve a differential equation to find its solution
- slope fields ⟶ way to qualitively measure the solution of a differential equation

- Shortcuts to solving slope field questions

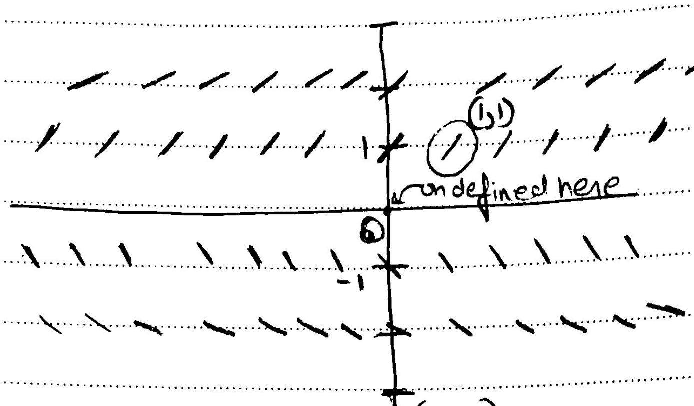


- Start from the given coordinate and trace out slope field.
- Webwork question 5 (extra notes)



When y = any multiple of $\frac{\pi}{2}$, and $x=0$, then always a horizontal line, therefore $\frac{dy}{dx}=0$ and solution y = integer.

if $\frac{dy}{dx} = \frac{1}{y}$ (1,1)



Slope = 1 ~~ish~~ at (1,1)
increasing
steepness of slope at y = any number is the same for all x i.e
$\frac{dy}{dx}$ is not dependent on x.

slope less steep as y increases

Lecture Notes (continued) 11.2

february 10th, 2020

$\frac{dy}{dx} = \frac{1}{y}$ Slope $= 1$ at $(1,1)$

Solve

$\int y\, dy = \int 1\, dx$ (numerical solution)

$\frac{y^2}{2} = x + C$

$y = \sqrt{2x + C}$ → general solutions

What is the solution of differential equation:

↳ a function that has the derivative equal to the differential equation.

$1 = \sqrt{2 + C}$ → general

$1 = 2 + C \qquad C = -1$ particular solution

generally for asymptotic solutions

february 12th, 2020.

11.3 : Euler's method

numerically plotting points on a solution curve.

$\Delta y = (\text{Slope at } P_x)\,\Delta x$

y value at P_{x+1} = (y value at P_x) ~~(Δy)~~ + Δy.

Error $\propto \frac{1}{n}$

Error = Exact − Approximate ~~value~~ value.