$-1x^{-1/2}$

6. $\frac{dy}{dx} = \boxed{\frac{1}{\sqrt{1-x^2}}} - \frac{1}{\sqrt{x}}$

$y = \sin^{-1}(x) \underline{-1x^{1/2}\cdot 2} + C$

$y = \sin^{-1}(x) - 2\sqrt{x} + C$

Section 7.1

Slope Fields and Euler's Method

Homework:

Day 1: 3-24 by 3

Day 2: 27-48 by 3

What you'll learn about

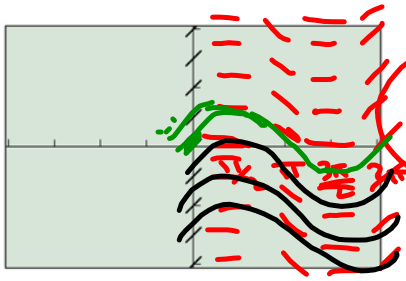
- Differential Equations ✓
- Slope Fields
- ~~Euler's Method~~

… and why

Differential equations have been a prime motivation for the study of calculus and remain so to this day.

Slope Field

The differential equation gives the slope at any point (x, y). This information can be used to draw a small piece of the linearization at that point, which approximates the solution curve that passes through that point. Repeating that process at many points yields an approximation called a **slope field**.



[−2π, 2π] by [−4, 4]

(a)

Construct a slope field for the differential equation

$$\frac{dy}{dx} = \cos x.$$

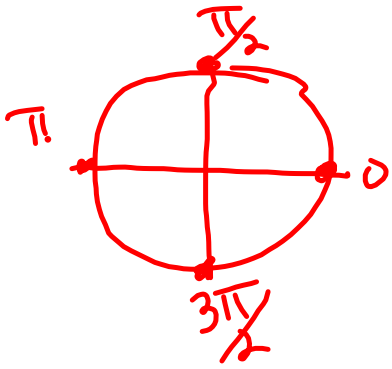
The slope at any point $(0, y)$ will be $\cos 0 = 1$.

The slope at any point (π, y) or $(-\pi, y)$ will be -1.

The slope at all odd multiples of $\frac{\pi}{2}$ will be 0.

The slope is 1 along the lines $x = \pm 2\pi$.

$y = \sin x + C$



$\frac{dy}{dx} = \cos 0 = 1$ (0, 1)

$\frac{dy}{dx} = \cos \pi = -1$

$\cos \frac{3\pi}{2} = 0$

$\frac{dy}{dx} = \cos \pi/2 = 0$ $(\pi/2, 0)$

program
slopefield, enter
enter
cos x, enter

Radians

EXAMPLE 7 Constructing a Slope Field for a Nonexact Differential Equation

Use a calculator to construct a slope field for the differential equation $dy/dx = x + y$ and sketch a graph of the particular solution that passes through the point $(2, 0)$.

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

$(0,1)\ (1,1)\ (2,1)\ (3,1)$

$1 \quad 2 \quad 3 \quad 4$

$(0,0)\ (1,0)\ (2,0)\ (3,0)$

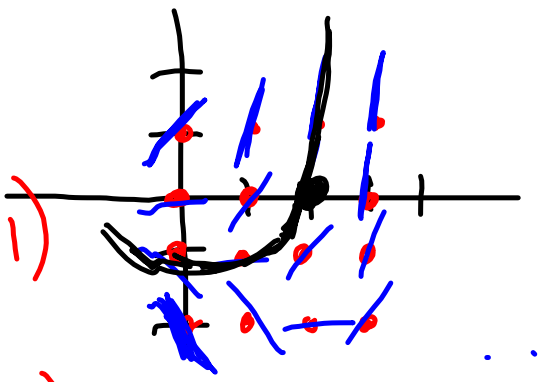
$0 \quad 1 \quad 2 \quad 3$

$(0,-1)\ (1,-1)\ (2,-1)\ (3,-1)$

$-1 \quad 0 \quad 1 \quad 2$

$(0,-2)\ (1,-2)\ (2,-2)\ (3,-2)$

$-2 \quad -1 \quad 0 \quad 1$



EXAMPLE 8 Matching Slope Fields with Differential Equations

Use slope analysis to match each of the following differential equations with one of the slope fields (a) through (d). (Do not use your graphing calculator.)

1. $\frac{dy}{dx} = x - y$ **2.** $\frac{dy}{dx} = xy$ **3.** $\frac{dy}{dx} = \frac{x}{y}$ **4.** $\frac{dy}{dx} = \frac{y}{x}$