# GitHub for Mathematicians

# GitHub for Mathematicians

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**Website**: `jmm2024.clontz.org`[1]

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[1] `jmm2024.clontz.org`
[2] `creativecommons.org/licenses/by-sa/4.0`

# Contents

# Abstract

Increasingly, the cyberinfrastructure of mathematics and mathematics education is built using GitHub to organize projects, courses, and their communities. The goal of this book is to help readers learn the basic features of GitHub available using only a web browser, and how to use these features to participate in GitHub-hosted mathematical projects with colleagues and/or students.

# JMM 2024 Details

This workshop will take place on Wednesday January 3, 2024, 1:00 p.m.-3:00 p.m, and Thursday January 4, 2024, 1:00 p.m.-3:00 p.m.

We will be located at Foothill E, Marriott Marquis San Francisco.

More information about JMM 2024 in San Francisco can be found at Joint-MathematicsMeetings.org[3].

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[3]www.jointmathematicsmeetings.org/meetings/national/jmm2024/2300_program.html

# Chapter 1

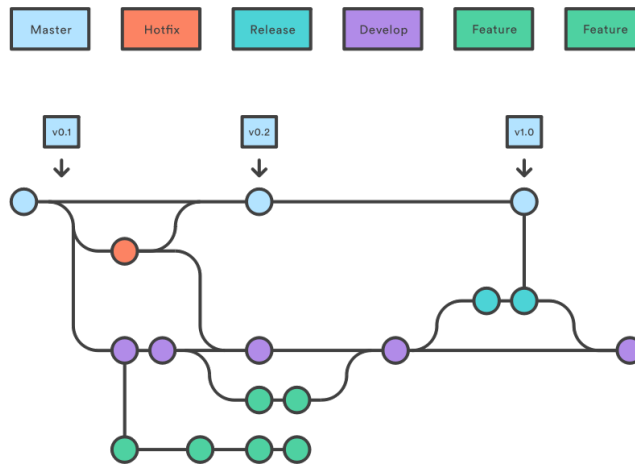# Git vs. GitHub

## 1.1 What Is Git?



**Figure 1.1.1** An illustration of a project's history controlled by Git

**Git** is a distributed version control system that tracks changes in any set of computer files. Git was originally authored by Linus Torvalds in 2005 for development of the Linux kernel. Git is free and open-source software.

Two core concepts of Git are **commits** (illustrated in Figure 1.1.1 by circles) and **branches** (illustrated in Figure 1.1.1 by lines). A commit represents the state of of your project at a particular point in its history. Branches allow this history to not be linear: you can branch off to experiment on a particular new feature, then merge this "feature branch" back into the "main branch" when it's complete. This is particularly useful when multiple people collaborate (Chapter 8) on a Git-managed project.

A Git project is often called a **repository**, or **repo** for short.

## 1.2 What Is Git*Hub*?

Another key feature of Git is the ability to share your project, along with its history, with other people. This is generally accomplished by hosting your repository on a service such as **GitHub**: GitHub.com[1]. (Other such services

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[1]`github.com`

include [BitBucket.org](#)[2] and [GitLab.com](#)[3].)

We'll use GitHub not only to host our repositories, but also because it provides all the tools needed to author content using only a web browser: no need for multiple installations or memorizing incantations like `git commit -m "foobar"` to type into a command line prompt.

## 1.3 An example

An example of a project using Git and GitHub is the document you're reading right now! This book is open-sourced and shared at `https://github.com/StevenClontz/github-for-mathematicians`, and was created completely using the tools described here.

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
[2]`bitbucket.org`
[3]`gitlab.com`

# Chapter 2

# Your First Repository

## 2.1 Making an account

All the features of GitHub we'll be using are available using a free GitHub account. Make your account by visiting `https://github.com/signup`.

Many mathematicians are also eligible for GitHub's educator discount, which provides additional functionality and computational resources normally only available to "Pro" users. Visit `https://education.github.com/` while logged into your account to request it. (You do not need to wait for approval before continuing to the next section.)

## 2.2 Creating the repo

Once logged in, a new repository can be created by pressing the $\boxed{+}$ button in the toolbar, or visiting `https://github.com/new`.

The repository will need a name, which can be something like `my-first-repo` for this tutorial. (GitHub will also suggest a cute random name like `ubiquitous-space-tribble` if you have writer's block.)

Repositories can be **public** to everyone on the internet or **private** to only people you approved. I encourage you to work publicly, to make it easier to collaborate with the open-source community – I can personally attest to publishing many garbage repositories on GitHub (along with my hopefully-useful ones), and no one has called me out for it yet!

The last option we'll make sure to select is to "Initialize this repository with: Add a README file". Then click "Create repository".

## 2.3 Editing README.md

While logged into GitHub.com, you have the ability to edit individual files on your repositories. (If your repository is public, others can see those files, but cannot edit them unless you make them a collaborator, see Chapter 8.)

An easy way to edit an individual file is just to click the pencil icon such as the one that appears on your README. This file is written in **Markdown**, a markup language that takes plain text `like *this*` and renders it "like *this*".

Try to edit your file to say something like "I'm learning how to use GitHub!", perhaps adding a link back to this document using `[this markup](https://jmm2024.clontz.org)`. You can click the Preview tab to see what your README will look like, or visit `https://www.MarkdownTutorial.com` to learn more.

When you're happy with your updated README, click the "Commit changes" button. This will create a new **commit**, representing a new moment in your project's history. You should write a useful commit message summarizing the work you've done since your last commit (or perhaps keep the default "Update README.md") Doing this will update the README visible on your repository homepage on GitHub.com.

## 2.4 Using GitHub.dev

Hello

## 2.5 Commiting and syncing

Hello

# Chapter 3

# Websites

Hello

## 3.1 Starting with a template

Hello

$$e = mc^2$$

## 3.2 Posts and pages

Hello

## 3.3 Tweaking the layout

Hello

## 3.4 Just let me host some HTML!

Hello

# Chapter 4

# $\pi$-Base Database for Topology

Hello

## 4.1 Starting with a template

Hello

$$e = mc^2$$

## 4.2 Posts and pages

Hello

## 4.3 Tweaking the layout

Hello

## 4.4 Just let me host some HTML!

Hello

# Chapter 5

# Writing and Running Code

Hello

## 5.1 Codespaces
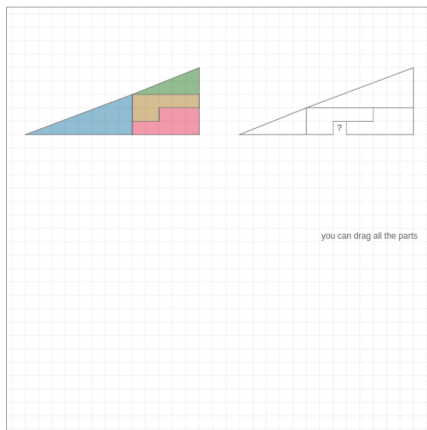
Hello

## 5.2 Jupyter notebooks

Hello

## 5.3 SageMath

Hello

# Chapter 6

# PreTeXt

## 6.1 What is PreTeXt?

Hello



**Figure 6.1.1** A sample interactive

**Checkpoint 6.1.2  Parsons Problem, Mathematical Proof.**  Create a proof of the theorem: If $n$ is an even number, then $n \equiv 0 \mod 2$.

- Click the heels of your ruby slippers together three times.

- Suppose $n$ is even.

-     Either:
      Then $n$ is a prime number.
      Or:
      Then there exists an $m$ so that $n = 2m$.
      Or:
      Then there exists an $m$ so that $n = 2m + 1$.

- Thus $n \equiv 0 \mod 2$.

- So we have the displayed equation:

$$n = 2m + 0.$$

This is a superfluous second paragraph in this block.

## 6.2 CheckIt

Hello

# Chapter 7

# Lean theorem prover

Hello

## 7.1 Starting with a template

Hello

$$e = mc^2$$

## 7.2 Posts and pages

Hello

## 7.3 Tweaking the layout

Hello

## 7.4 Just let me host some HTML!

Hello

# Chapter 8

# Collaborating with Students and Colleagues

Hello

## 8.1 LiveShare

Hello

## 8.2 Adding collaborators

Hello

## 8.3 Forks and Pull Requests

Hello

## Colophon

This book was authored in PreTeXt.