Towards Level 400 Project Work

Research Methodologies in Mathematics
Here, I will share a LaTeX template with you that outlines the basic structure one needs to follow to develop a dissertation/thesis in mathematics.

Scientific Writing and Data Analysis Tools
I have attached a document that explains scientific writing. For data analysis tools, one can use R software and Python, in addition to many other software options.

Version Control Software
Version control software keeps track of every modification to the code in a special kind of database. If a mistake is made, developers can turn back the clock and compare earlier versions of the code to help fix the mistake while minimizing disruption to all team members.

GitHub is a perfect example of a version control software. Use the following YouTube link as a guide to install and setup GitHub on your Linux, Windows or MacOS.

Linux: https://www.youtube.com/watch?v=bc3_FL9zWWs
Windows: https://www.youtube.com/watch?v=3JdDAJ2YPeU
MacOS: https://www.youtube.com/watch?v=tiQXqQ1YSPM

Note that you need to learn some terminologies associated with GitHub and its use. Use the link below to learn more about it.
https://www.youtube.com/watch?v=tRZGeaHPoaw

There are other systems that behaves somewhat like GitHub except it is much simpler and less robust compared to git in terms of version control abilities. Examples are Dropbox, OneDrive, Google Drive etc. For our purposes as students, Dropbox will do the job.

Dropbox:
Use the following YouTube link as a guide to install and setup Dropbox on your Linux, Windows or MacOS.

Linux: https://www.youtube.com/watch?v=pG8VCb9Ay7I
Windows: https://www.youtube.com/watch?v=vSIyOvq54Hs
MacOS: https://www.youtube.com/watch?v=TAjOlLe_Q6U

LaTeX
A typesetting software for scientific work, with a focus on mathematics. For many people the most useful part of LaTeX is the ability to typeset complex mathematical formulas. for the sake of simplicity, LaTeX separates the tasks of typesetting mathematics and typesetting normal text. This is achieved by the use of two operating modes, paragraph and math mode.

How to install Latex:
Please use the YouTube link below as a guide to install Latex.

Linux: https://www.youtube.com/watch?v=ioy7e7fxjHo
Windows: https://www.youtube.com/watch?v=ikP8BNQ2344
MacOS: https://www.youtube.com/watch?v=MeeLtx_VcuI&t=1s

Mathematical Programming Softwares

There are many mathematical programming softwares namely, Mathematica, Matlab, Maple, SageMath, Octave, Maxima, GAP, Cadabra, Geogebra etc. We will only discuss two of the softwares that are open source.

SageMath:

It is a free open-source mathematics software system licensed under the GPL. It builds on top of many existing open-source packages: NumPy, SciPy, matplotlib, Sympy, Maxima, GAP, FLINT, R and many more. Access their combined power through a common, Python-based language or directly via interfaces or wrappers.

How to install SageMath: Follow the YouTube link to install.

Linux: (type, *sudo apt install sagemath*) https://www.youtube.com/watch?v=PvJHLCjuMA0

Windows: https://www.youtube.com/watch?v=FjzWmzxZL_8

MacOS: https://www.youtube.com/watch?v=i8AweQ2GyS0

Geogebra:

It is an interactive geometry, algebra, statistics and calculus application, intended for learning and teaching mathematics and science from primary school to university level. Geogebra is available on multiple platforms, with apps for desktops, tablets and web.

I use this software predominantly to produce diagrams. It can do much more than that.

Installation: Linux, Windows and MacOS

Use the YouTube link below to install on any of the platforms above.

https://www.youtube.com/watch?v=mJvfBjv74OA&t=1s

1 A. L. Mahu (PhD) | Department of Mathematics, University of Ghana