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To the Student

MTH 251 is taught at Portland Community College using a lecture/lab format. The laboratory time is set aside for students to investigate the topics and practice the skills that are covered during their lecture periods.

The lab activities have been written under the presumption that students will be working in groups and will be actively discussing the examples and problems included in each activity. Many of the exercises and problems lend themselves quite naturally to discussion. Some of the more algebraic problems are not so much discussion problems as they are "practice and help" problems.

You do not need to fully understand an example before starting on the associated problems. The intent is that your understanding of the material will grow while you work on the problems.

When working through the lab activities the students in a given group should be working on the same activity at the same time. Sometimes this means an individual student will have to go a little more slowly than he or she may like and sometimes it means an individual student will need to move on to the next activity before he or she fully grasps the current activity.

Many instructors will want you to focus some of your energy on the way you write your mathematics. It is important that you do not rush through the activities. Write your solutions as if they are going to be graded; that way you will know during lab time if you understand the proper way to write and organize your work.

If your lab section meets more than once a week, ***you should not work on lab activities between lab sections that occur during the same week***. It is OK to work on lab activities outside of class once the entire classroom time allotted for that lab has passed.

There are not written solutions for the lab activity problems. Between your group mates, your instructor, and (if you have one) your lab assistant, you should know whether or not you have the correct answers and proper writing strategies for these problems.

Each lab has a section of supplementary exercises; these exercises are fully keyed. The supplementary exercises are not simply copies of the problems in the lab activities. While some questions will look familiar, many others will challenge you to apply the material covered in the lab to a new type of problem. These questions are meant to supplement your textbook homework, not replace your textbook homework.

The MTH 251 Laboratory Manual was written by Steve Simonds.

The cover art for the manual was designed by Phil Thurber.

The cover includes a page from Isaac Newton's ***Philosophiæ Naturalis Principia Mathematica***.

The cover includes William Blake's "**Newton**."

To the Instructor

This manual is significantly different from earlier versions of the lab manual. The topics have been arranged in a developmental order. Because of this, students who work each activity in the order they appear may not get to all of the topics covered in a particular week.

It is strongly recommended that the instructor pick and choose what they consider to be the most vital activities for a given week and that the instructor have the students work those activities first; for some activities you might also want to have the students only work selected problems in the activity. Students who complete the high priority activities and problems can then go back and work the activities that they initially skipped. There are also fully keyed problems in the supplementary exercises that the students could work on both during lab time and outside of class.

A suggested schedule for the labs is shown in Table P1. Again, the instructor should choose what they feel to be the most relevant activities and problems for a given week and have the students work those activities and problems first.

Table P1: Possible 10 week schedule for the labs. (Students should consult their syllabus for their schedule.)

Week	Labs (Lab Activities)	Supplementary Exercises
1	Rates of Change/Limits and Continuity (1-4)	E1 (all)
2	Limits and Continuity (5-16)	E2 (all)
3	Introduction to the First Derivative (17-20)	E3 (all)
4	Functions, Derivatives, and Antiderivatives (21-24)	E4.1-E4.5
5	Functions, Derivatives, and Antiderivatives (25-26)	E4.6-E4.10
6	Derivative Formulas (27-37)	E5 (all)
7	The Chain Rule (38-41)	E6 (all)
8	Implicit Differentiation/Related Rates (42-47)	E7 (all), E8 (all)
9 and 10	Critical Numbers and Graphing from Formulas (48-54)	E9 (all)