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| **MATH 1LS3 \* SCHEDULE AND HOMEWORK**  **Due to the way classes are scheduled, some sections might be a bit ahead or a bit behind the posted schedule.** However, in total, all sections  will have exactly the same number of lectures. All sections of the course write the same tests and the same exam. We are aware that some 1LS3 tutorials are not  scheduled at the best possible times, but unfortunately there is nothing we can do about it, as scheduling classes is beyond our control.  All references to sections are based on 2nd edition (geese). Click [here](https://ms.mcmaster.ca/lovric/1LS3/1LS3comparisonfirstsecondedition.html) to see how it translates to the 1st edition (elephants).  **Work on all homework questions. If you feel that you need more practice with certain topics, solve some, or all of the suggested questions, as listed for**  **each section (the list refers to the second edition of our textbook; if you have the first edition,**[**download these two pages**](https://ms.mcmaster.ca/lovric/1LS3/pdfs/textbook_questions_elephants.pdf)**).**   |  |  |  | | --- | --- | --- | | **Week** | **What's done, what's ahead** | **Homework - what you should do before the first lecture of the following week** | | 6-11 Sept | Course introduction ([slides](https://ms.mcmaster.ca/lovric/1LS3/pdfs/1LS3_lecture_zero_1617.pdf)), **Section 1.1**  This week we discuss the material from **sections 1.2, 1.3 and 2.1** (we cover some of **1.3** this week, and the remaining parts next week).  We will say what a model is, give many examples and review basic properties of functions and graphs. | Look at this web page (click on the links of the left) to make yourself familiar with what information you can find here. Make sure you read the course outline. Work on **assignment 0** from your coursepack [if you don't have your coursepack yet, download [assignment 0](https://ms.mcmaster.ca/lovric/1LS3/pdfs/assg0.pdf)]. All assignments are for your practice, and are not collected for marks.  We start our lectures with the [zika virus model](https://ms.mcmaster.ca/lovric/1LS3/pdfs/zika_model.pdf). If you have the 2nd edition (geese) textbook, read section 1.1 (no math exercises there). If you have the 1st ed (elephants) textbook, read section 1.1 from [here](https://ms.mcmaster.ca/lovric/1LS3/pdfs/section1.1.pdf). Optional:[link to the zika model paper](http://www.nature.com/articles/srep28070) (have a look, to see what a research paper looks like - what it consists of, how it's written, etc.).  [Why do we study functions and not relations (slides)?](https://ms.mcmaster.ca/lovric/1LS3/pdfs/why_functions.pdf)  Read section 1.2 to learn about models and types of dynamical systems; look at all tables and read examples. Go over all solved examples in section 2.1; in particular, study examples 2.1.9, 2.1.14 and 2.1.15. From your coursepack: finish**assignment 0**; work on **assignment 1**and **assignment 6 (questions 1-7)**. For extra practice with conversion of units, and if you are not sure about question #5 on assignment 6, solve all problems on **assignment 5;**conversion factors are given in the handout [conversion of units](https://ms.mcmaster.ca/lovric/1LS3/pdfs/conversion_units.pdf) (this sheet also tells you which conversions you need to know, and which conversions will be given on a test if needed).  [BMI (body mass index) slides.](https://ms.mcmaster.ca/lovric/1LS3/pdfs/bmi_not_for_kids.pdf)  Suggested extra practice (textbook): section 2.1: 9, 13, 15, 23, 27, 29, 35, 37, 41, 43, 45, 49, 61.  Download blank assignments: [assignment 0](https://ms.mcmaster.ca/lovric/1LS3/pdfs/assg1.pdf), [assignment 1](https://ms.mcmaster.ca/lovric/1LS3/pdfs/assg1.pdf), [assignment 5](https://ms.mcmaster.ca/lovric/1LS3/pdfs/assg5.pdf), [assignment 6](https://ms.mcmaster.ca/lovric/1LS3/pdfs/assg6.pdf)  Solutions: [assignment 0](https://ms.mcmaster.ca/lovric/1LS3solutions/assg0solutionsLS.pdf), [assignment 1](https://ms.mcmaster.ca/lovric/1LS3solutions/assg1solutionsLS.pdf), [assignment 5](https://ms.mcmaster.ca/lovric/1LS3solutions/assg5solutionsLS.pdf), [assignment 6](https://ms.mcmaster.ca/lovric/1LS3solutions/assg6solutionsLS.pdf) | | 12-18 Sept | This week we study **sections 1.3, 1.4 and 2.2**(composition of functions, transformations of graphs and inverse functions, exponential and logarithm functions  Related to exponential growth and decay: [half-lives of some drugs](https://ms.mcmaster.ca/lovric/1LS3/pdfs/half_lives_of_drugs.pdf), [doubling time of breast cancer growth](https://ms.mcmaster.ca/lovric/1LS3/pdfs/doubling_times_breast_cancer.pdf). These slides are for your information, no need to memorize anything that's there. | Section 2.1: if you haven't done it already - study examples 2.1.11 to 2.1.15 in detail, to see how elementary functions are used in modelling, to practice linear and power functions, as well as the concept of proportional/ inversely proportional.  Go over solved examples in section 1.3, and recall graphs given in the subsection *Catalogue of Important Functions.*  Study questions 1, 3, 4 from **assignment 50** (wait until it's discussed in class first). Have questions ready for your tutorial, or email suggestions to your instructor. Slides shown in lectures: [functions in context](https://ms.mcmaster.ca/lovric/1LS3/pdfs/functions_in_context.pdf).  Work through questions on **assignment 2**. **Assignment 3** will help you review and gain routine with exponential and logarithm functions. To make sure you understand all concepts in chapters 1 and 2, work on all **assignment 6** questions.  Work through solved examples in sections 1.4 and 2.2. For practice with semilog graphs, study examples 2.2.16 and 2.2.17 and then work through **assignment 7** [fix the typo in question 2(e): replace 'In your graph in (b)' with 'In your graph in (d)']  [Clarification of the words 'scale,' 'expand,' 'contract,' etc. as we use them for transformations of graphs.](https://ms.mcmaster.ca/lovric/1LS3/pdfs/explain_transformations.pdf)  **This is lots of homework**, but we do it because we want you to learn this stuff. Make an effort now - the things that come next will be lots easier to understand.  [Slides about radiocarbon dating](https://ms.mcmaster.ca/lovric/1LS3/pdfs/radio_dating.pdf) are optional (except for the last slide: you have to know how to calculate the formula for C(t) based on the half-life information, and how to answer the question asked there).  Suggested extra practice (textbook): section 1.3: 5, 7, 11, 15, 19, 21, 25, 29, 33, 39, 43; section 1.4: 7, 11, 17, 19, 23, 27, 37, 41, 45, 51, 53, 55, 59; section 2.2: 7, 13, 17, 19, 21, 25, 29, 31, 35, 41, 45, 49, 55, 59, 63;  Solutions: [assignment 2](https://ms.mcmaster.ca/lovric/1LS3solutions/assg2solutionsLS.pdf), [assignment 3](https://ms.mcmaster.ca/lovric/1LS3solutions/assg3solutionsLS.pdf), [assignment 6](https://ms.mcmaster.ca/lovric/1LS3solutions/assg6solutionsLS.pdf), [assignment 7](https://ms.mcmaster.ca/lovric/1LS3solutions/assg7solutionsLS.pdf), [assignment 50](https://ms.mcmaster.ca/lovric/1LS3solutions/assg50solutionsLS.pdf) | | 19-25 Sept | **Sections 2.3, 4.1 and 4.2.**We finish our review of functions (we discuss trig and inverse trig functions), and start working on limits  [Link to an applet](http://math.mercyhurst.edu/~lwilliams/Applets/TrigTransformation.html) that lets you practice transformations of trig graphs.  Note: Chapter 3 will be covered near the end of the term, after integration | For trig and inverse trig, work on **assignment 4**. To make sure you understand all concepts in chapters 1 and 2, work on all **assignment 5** questions. Work through solved examples in section 2.3 in your textbook; in particular 2.3.13. and 2.3.14 about inverse trig, as this is new to almost everyone; study the table on page 99 (page 82 in old edition) to check your understanding of transformations of graphs.  Finish working on chapter 2. Read examples 2.3.15 and 2.3.16 to see that inverse trig functions are really used in applications. Example 2.3.15 (analyzing blood stains) is also given on [these slides](https://ms.mcmaster.ca/lovric/1LS3/pdfs/bloodstains_analysis.pdf). Finish all questions on **assignment 50.** Work on**assignment 51** to practice periodic functions, transformations of functions and double log graphs.  Read all of section 4.1 - the only concept introduced (rate of change) is not difficult, but it takes a bit of practice to feel comfortable with the language and the notation used.To study rates of change and calculation of limits from graphs, work on**assignment 8, exercises 1-5**. Study all solved examples in section 4.2, as it's all there: concepts are illustrated in examples 4.2.1 and 4.2.2, and various situations involving calculations of limits are covered in the remaining fifteen examples (lots of examples, but it's worth it). Squeeze theorem (pages 200/201) is optional. After algebraic calculations of limits are covered in your lecture (section 4.2), finish**assignment 8.**  Suggested extra practice (textbook): section 2.3: 5, 9, 15, 25, 29, 35, 47, 55, 57, 65, 69, 75; section 4.1: 3, 7, 9, 11, 15, 21; section 4.2: 3, 5, 7, 9, 13, 23, 25, 31, 35, 37, 45, 49, 55, 63, 65.  Solutions: [assignment 4](https://ms.mcmaster.ca/lovric/1LS3solutions/assg4solutionsLS.pdf), [assignment 5](https://ms.mcmaster.ca/lovric/1LS3solutions/assg5solutionsLS.pdf), [assignment 8](https://ms.mcmaster.ca/lovric/1LS3solutions/assg8solutionsLS.pdf), [assignment 50](https://ms.mcmaster.ca/lovric/1LS3solutions/assg50solutionsLS.pdf), [assignment 51](https://ms.mcmaster.ca/lovric/1LS3solutions/assg51solutionsLS.pdf) | | 26 Sept - 2 Oct | We work on limits and continuity: **sections 4.2, 4.3 and 4.4.**  Optional for now: slides about [UV-index](https://ms.mcmaster.ca/lovric/1LS3/pdfs/uv_index.pdf) (example of a discontinuous function on page 2) | Study solved examples in section 4.3; make sure you can quote definitions of horizontal and vertical asymptotes. Look at table on page 216 for different cases of limits, and to learn how to answer a question about limits. Subsections 'Application to absorption functions' and 'Limits of Sequences' are optional for now (we'll get back to them later). Work on **assignment 9**.  **Assignment 10** checks your understanding of concepts of limits and continuity; start working on it right away, by answering questions about limits; after continuity is discussed in your lecture, finish the assignment.  Section 4.2: Squeeze theorem (pages 200-201) is optional; Section 4.3: subsections 'Application to Absorption Functions' and 'Limits of Sequences' are optional. Section 4.4: Study statements of theorems 4.4.1-4.4.5, so that you can justify your steps in questions about continuous functions. Subsections 'Input and Output Precision' and 'Hysteresis' are optional.  Finish **assignment 51** and work on **assignment 52**, exercises 1, 2 and 3.  Suggested extra practice: section 4.3: 5, 9, 11, 15, 17, 21, 23, 29, 33, 37, 41, 43, 47, 49, 51, 55, 61, 63, 71, 73, 77, 79, 81; section 4.4: 1, 5, 7, 11, 15, 19, 25, 27, 35, 39, 41.  Solutions: [assignment 9](https://ms.mcmaster.ca/lovric/1LS3solutions/assg9solutionsLS.pdf), [assignment 10](https://ms.mcmaster.ca/lovric/1LS3solutions/assg10solutionsLS.pdf), [assignment 51](https://ms.mcmaster.ca/lovric/1LS3solutions/assg51solutionsLS.pdf), [assignment 52](https://ms.mcmaster.ca/lovric/1LS3solutions/assg52solutionsLS.pdf) | | 3-9 Oct | **Test 1: Monday, October 3, 2016**  Differentiation and computing derivatives: **sections 4.5 and 5.1-5.5**  users of the first (elephant) edition: [download section 5.5 (implicit differentiation)](https://ms.mcmaster.ca/lovric/1LS3/pdfs/implicit_section5.5.pdf) | Study all examples in sections 4.5 to make yourself understand concepts.  Chapter 5 sections contain technical rules about calculating derivatives. Study all examples in sections 5.1 and 5.2 (to gain routine in calculating derivatives); derivations (i.e., proofs) of the product and the quotient rules in 5.2 are optional (optional means it's not on tests and/or exam). As well, go over all solved examples in sections 5.3-5.5. In section 5.3, the subsection 'Proof of the Chain Rule' is optional. In section 5.4, the subsection 'Derivations of Key Limits' is optional. Study examples in section 5.5. Homework: **assignments 11, 12 and 13.**  Suggested extra practice: section 4.5: 1, 3, 5, 9, 11, 15, 19, 23, 25, 33, 41, 45, 51, 53; section 5.1:5, 7, 11, 19, 21, 25, 31, 35, 37, 41; section 5.2: 7, 11, 13, 21, 25, 29, 37, 41; section 5.3: 7, 11, 19, 23, 25, 31, 35, 39, 45, 47; section 5.4: 3, 7, 13, 15, 19, 23, 26, 27, 49, 51, 55; section 5.5: 3, 5, 13, 17.  Solutions: [assignment 11](https://ms.mcmaster.ca/lovric/1LS3solutions/assg11solutionsLS.pdf), [assignment 12](https://ms.mcmaster.ca/lovric/1LS3solutions/assg12solutionsLS.pdf), [assignment 13](https://ms.mcmaster.ca/lovric/1LS3solutions/assg13solutionsLS.pdf) | | 10-16 Oct | Recess, no classes | Recess, no classes | | 17-23 Oct | We continue with the routines of differentiation: **sections 5.6, 5.7** and then start with applications (extreme values) in**section 6.1** | Work on**assignment 14**. Section 5.6: subsection 'Acceleration' is optional. For extra practice with approximations (section 5.7) work on**assignment 15.** As well, study examples 5.7.1-5.7.3, 5.7.5-5.7.8, 5.7.10-5.7.11. Approximation of functions is a new concept, so we need practice.  Section 5.7 introduces new concepts. Work through examples in this section to gain routine with approximations.  Once you feel you are good with calculating abstract derivatives, work on applications in**assignment 53,** questions 3, 4, and 5. To practice critical points and extreme values, work on **assignment 16,** question #4. Section 6.1: study all examples 6.1.1-6.1.10.  Suggested extra practice: section 5.5: 23, 25, 29, 31; section 5.6: 1, 5, 7, 15, 19, 23, 27; section 5.7: 1, 3, 5, 7, 11, 15, 17, 29, 31; section 6.1: 7, 13, 15, 19, 23, 27.  Solutions: [assignment 14](https://ms.mcmaster.ca/lovric/1LS3solutions/assg14solutionsLS.pdf), [assignment 15](https://ms.mcmaster.ca/lovric/1LS3solutions/assg15solutionsLS.pdf), [assignment 16](https://ms.mcmaster.ca/lovric/1LS3solutions/assg16solutionsLS.pdf), [assignment 53](https://ms.mcmaster.ca/lovric/1LS3solutions/assg53solutionsLS.pdf) | | 24-30 Oct | We continue with **section 6.1,** then discuss **section 6.4**(L'Hopital's rule part only) and start **section 7.1** | Finish **assignment 16.** Section 6.1: study all examples 6.1.10-6.1.15.  After section 6.4 is covered in class work on **assignment 18**. For now, we cover only L'Hopital's rule part of the section (page 396 to end of section). To gain routine, study all examples 6.4.9-6.4.19. All possible cases of indeterminate forms are there.  To further practice L'Hopital's rule, work on questions 2 and 3 from **assignment 17**.  Section 7.1 covers concepts which connect thinking about derivatives with differential equations, and also serves as introduction to integration. Work on questions 1, 4, 5, 6, 8 and 9 from **assignment 19.**  Suggested extra practice: section 6.1: 31, 35, 39, 41, 45, 47; section 6.4: 17, 21, 25, 27, 31, 35, 37; section 7.1: 3, 7, 11, 13, 17, 19, 21, 23, 27, 39.  Solutions: [assignment 16](https://ms.mcmaster.ca/lovric/1LS3solutions/assg16solutionsLS.pdf), [assignment 17](https://ms.mcmaster.ca/lovric/1LS3solutions/assg17solutionsLS.pdf), [assignment 18](https://ms.mcmaster.ca/lovric/1LS3solutions/assg18solutionsLS.pdf), [assignment 19](https://ms.mcmaster.ca/lovric/1LS3solutions/assg19solutionsLS.pdf) | | 31 Oct - 6Nov | **Test 2 Monday, October 31, 2016**  Introduction to differential equations and antiderivatives  We work on **sections 7.1**and**7.2**and start **section 7.3** | Integration (antiderivatives) is new material, so we move slower.  Finish **assignment 19.** After Euler's method is covered in class, work through examples 7.1.8-7.1.10 in your textbook, and also answer all questions on **assignment 20.**  Study examples in sections 7.1 and 7.2, to learn terminology, and to understand new stuff. Section 7.2: acceleration examples (7.2.13 and 7.2.14) are optional. Work on **assignment 21**. As well, review #8 on **assignment 13**.  Section 7.3: Example 7.3.3 is optional, but is a good opportunity to understand definite integrals better. Sigma notation is optional, but good to know. Work through solved examples, in particular 7.3.1, 7.3.2, 7.3.4, 7.3.5-7.3.12. Work on **assignment 22** to practice the concept of definite integral and area.  Suggested extra practice: section 7.2: 1, 5, 9, 13, 15, 17, 19, 21, 23, 31, 33; section 7.3: 3, 29, 31, 35, 39, 41, 45, 49, 51, 57  Solutions: [assignment 13](https://ms.mcmaster.ca/lovric/1LS3solutions/assg13solutionsLS.pdf), [assignment 19](https://ms.mcmaster.ca/lovric/1LS3solutions/assg19solutionsLS.pdf), [assignment 20](https://ms.mcmaster.ca/lovric/1LS3solutions/assg20solutionsLS.pdf), [assignment 21](https://ms.mcmaster.ca/lovric/1LS3solutions/assg21solutionsLS.pdf), [assignment 22](https://ms.mcmaster.ca/lovric/1LS3solutions/assg22solutionsLS.pdf) | | 7-13 Nov | Finish **section 7.3** and work on **section 7.4**  Definite integrals and evaluation of definite integrals; first applications | Finish **assignment 22.** Section 7.4: work through all examples 7.4.2-7.4.4 and 7.4.5-7.4.11, 7.4.13. Skip subsection 'Integral Function and Proof of the FTC.' Use **assignment 23** to drill integration. As well, work on #1 on **Assignment 24.** To practice concepts, work on**assignment 26,** exercises 1, 2 and 4.  To practice applications, work on **assignment 55.**To reinforce the idea of approximating sums (Riemann sums), [look at this example](https://ms.mcmaster.ca/lovric/1LS3/pdfs/riemannsums.pdf), and also approximation of [surface area of Lake Ontario](https://ms.mcmaster.ca/lovric/1LS3/pdfs/area_of_lake_ontario.pdf).  Suggested extra practice: section 7.4: 7, 11, 13, 17, 21, 23, 27, 29, 33, 37, 39, 41.  Solutions: [assignment 22](https://ms.mcmaster.ca/lovric/1LS3solutions/assg22solutionsLS.pdf), [assignment 23](https://ms.mcmaster.ca/lovric/1LS3solutions/assg23solutionsLS.pdf), [assignment 24](https://ms.mcmaster.ca/lovric/1LS3solutions/assg24solutionsLS.pdf), [assignment 26](https://ms.mcmaster.ca/lovric/1LS3solutions/assg26solutionsLS.pdf), [assignment 55](https://ms.mcmaster.ca/lovric/1LS3solutions/assg55solutionsLS.pdf) | | 14-20 Nov | **Test 3 Monday, November 14, 2016**  We work on integration techniques and applications: **sections 7.5 and 7.6**  [An example of integration using Taylor polynomial](https://ms.mcmaster.ca/lovric/1LS3/pdfs/integralbytaylor.pdf) | Section 7.6: Subsection 'Integrals and Volumes' is new to the second edition of the textbook; first edition users: [you can download this subsection from here](https://ms.mcmaster.ca/lovric/1LS3/pdfs/volumeparttextbook.pdf). Subsection 'Integrals and Lengths is optional.  To practice integration by parts, work on **assignment 25.** After area is covered in section 7.6, finish **assignment 24.**Work through all questions on **assignment 26**, to make sure you understand all concepts about integration. As well, work on **assignment 27,** questions 1-6.  If you need it: review long division (needed for instance in question 3c in Assignment 24) by watching this 10-minute [video tutorial](http://www.youtube.com/watch?v=l6_ghhd7kwQ).  After volumes are discussed in class, work on **assignment 29.** [Volume of a heart chamber slides](https://ms.mcmaster.ca/lovric/1LS3/pdfs/volume_of_heart.pdf).  Suggested extra practice: section 7.5: 5, 9, 13, 17, 21, 25, 29, 33, 41, 43, 51, 53, 59, 63, 71; section 7.6: 3, 9, 11, 15, 19, 33, 37, 41, 53, 77, 79.  Solutions: [assignment 24](https://ms.mcmaster.ca/lovric/1LS3solutions/assg24solutionsLS.pdf), [assignment 25](https://ms.mcmaster.ca/lovric/1LS3solutions/assg25solutionsLS.pdf), [assignment 26](https://ms.mcmaster.ca/lovric/1LS3solutions/assg26solutionsLS.pdf), [assignment 27](https://ms.mcmaster.ca/lovric/1LS3solutions/assg27solutionsLS.pdf), [assignment 29](https://ms.mcmaster.ca/lovric/1LS3solutions/assg29solutionsLS.pdf) | | 21-27 Nov | We finish integration by discussing improper integrals in **section 7.7** and start dynamical systems, **sections 3.1 and 3.2.** | Section 7.7: Skip the subsections' Applying the Method of Leading Behaviour to Improper Integrals' (pages 577-578), 'Comparison Test' (pages 578-579) and 'Applying the Method of Leading Behaviour to Improper Integrals' (pages 581-583).  Finish **assignment 27** and work on all questions from **assignment 28**.  Section 3.1: study examples 3.1.1-3.1.6, and remember what basic additive and basic exponential discrete systems are; the material from start of Example 3.1.7 on page 119 to end of example 3.1.10 on page 122 is optional. Study all examples in section 3.2.  Work on **assignment 31** (all questions) and **assignment 32** (questions 1-6). This material is new to almost everyone. So, it makes sense to go over \*all\* solved examples in the textbook (examples 3.1.7-3.1.10 are optional) and work on assignments 31 and 32.  Suggested extra practice: section 7.7: 5, 7, 9, 13, 17, 21; section 3.1: 3, 7, 11, 13, 19, 23, 39; section 3.2: 3, 5, 7, 9, 15, 17, 21, 25.  solutions: [assignment 27](https://ms.mcmaster.ca/lovric/1LS3solutions/assg27solutionsLS.pdf), [assignment 28](https://ms.mcmaster.ca/lovric/1LS3solutions/assg28solutionsLS.pdf), [assignment 31](https://ms.mcmaster.ca/lovric/1LS3solutions/assg31solutionsLS.pdf), [assignment 32](https://ms.mcmaster.ca/lovric/1LS3solutions/assg32solutionsLS.pdf) | | 28 Nov - 4 Dec | **Test 4 Monday, November 28, 2016**  We continue with dynamical systems: applications in **section 3.3** and stability, **sections 6.7 and 6.8** | In section 3.3 we use math to model things such as population growth and caffeine and/or alcohol consumption and absorption ([caffeine slides](https://ms.mcmaster.ca/lovric/1LS3/pdfs/caffeine_data.pdf) [alcohol slides](https://ms.mcmaster.ca/lovric/1LS3/pdfs/alcohol_dynamics.pdf)). No need to remember the formulas which appear in population and alcohol models (of course, once given, you need to know how to work with them).  For stability, work on **assignment 33.** As well, work through all examples 6.7.1 to 6.7.8. Section 6.8: Subsection 'Ricker model' is optional.  Suggested extra practice: section 3.3: 3, 5, 11, 13, 17; section 6.7: 3, 5, 7, 9; section 6.8: 9, 11, 19.  Solutions: [assignment 33](https://ms.mcmaster.ca/lovric/1LS3solutions/assg33solutionsLS.pdf) | | 5-7 Dec | **7 December: last day of classes** | Finishing the content.  [Exam review, exam information](https://ms.mcmaster.ca/lovric/1LS3/pdfs/1LS3_final_exam_information.pdf). | |