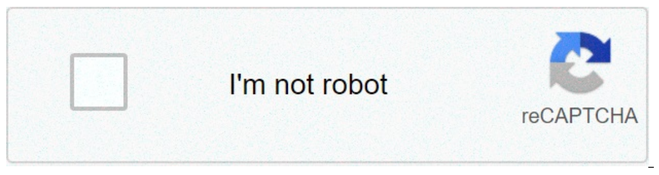

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Active calculus textbook solutions

This appendix contains answers to all non-WeBWorK exercises in the text. For WeBWorK exercises, please use the HTML version of the text for access to answers and solutions. ¶ Edfinity is supported by the National Science Foundation \(ewcommand{\dollar}{\$} \DeclareMathOperator{\erf}{erf} \DeclareMathOperator{\arctanh}{arctanh} ewcommand{\lt}{} ewcommand{\amp}{&} \) Hello everyone,I'd like to publicize a few related items here. Active Calculus is an open textbook for calculus with an inquiry-based learning approach. Matt Boelkins of Grand Valley State University is the lead author and manager of the project, and the site for this book is: new edition of Active Calculus is going to be the first widely used textbook that uses WeBWorK integration at its source, calling on problems from the OPL. This means several things.The eBook (linked within the above) has embedded WeBWorK cells for roughly half of the exercises. (No credit is recorded for a student reader checking answers this way.) The print version (also linked) has the same problems printed in a static format. You can get a .tgz file with all that you need for homework sets corresponding to each section of the book. (Most/all problems use randomization, so assigned versions will be different than the eBook versions.) This is all possible because of PreTeXt, a tool set for authoring open (text)books. PreTeXt is the creation of Rob Beezer of University of Puget Sound. Additionally, the support for WeBWorK within PreTeXt originally came from an OpenOregon grant, and has continued with support from my institution, Portland Community College. Page 2 Skip Navigation Skip Administration Forum administration Page 3 WeBWorK News Forum News from the WeBWorK project. To post to these forums you need to first register on the wiki at once your registration is accepted login to Moodle with the same username and password as you used on the wiki and click on My courses ->UsingWW->Administration->Enrol me in UsingWW course WeBWorK News (before August 2010) URLAnnouncements Forum - - 1 Math 1A Class Preparatory Work (CP) Assignments (NON-CORE ASSIGNMENT) NOTE: It is vital that you read this document in its entirety. If you omit any part of this, you are likely to lose valuable points toward your grade. The course is divided into 20-22 MODULES that are covered at the rate of about 2 per week. Each Module has an associated Class Preparatory ("CP") assignment. These assignments lead you to meet key learning goals on your own and be better prepared for upcoming material that we will study in our class meeting. They will also help solidify prior material. Each CP will involve the following types of work: 1. Read a part of the next section to be covered. 2. Complete the first activity called a "Preview Activity" and one Regular Activity from the Activities Workbook by Boelkins, 3. Watch a short YouTube video and 4. Complete one of the end-of-section exercises. You should allow about 90 - 120 minutes twice per week for this assignment, assuming you are opting to submit CPs for credit . If not, then you can do this work in about half of the time. That makes up 3 - 4 hours of the 10 – 12 hours needed per week for this 5 – unit class. As explained in the syllabus, you may submit any number of these for credit toward your final course grade up to a maximum of 10. This is the " CP for credit" option outlined in the syllabus. If you choose to submit the ten creditable CPs according to the Professional Formatting Guidelines later in this document, they are equal in weight to about one quarter of the final exam - i.e. 100 points. They will be graded according to the detailed rubric contained later in this document. If you decide not to submit these for credit, you still need to work them although you will not need to make them professionally formatted since they will be seen only by you. A "Non-Punitive" Grading System; grading scale is R, 8, 9 or 10 out of 10! [Applies to students opting of the "CPs for credit" option.] The grading protocol in my class is set up so that a student cannot receive less than 8/10 on a CP assignment. Any CP assignments that are not written to the Professional Formatting Guidelines described in this document will be returned to the student with a grade of "R" for "returned" and the grade on it forfeited. This is not equivalent to a zero score – rather I am opting you out to protect your grade. Though you will NOT be penalized for returned work that does not meet the formatting guidelines, it will mean License: Creative Commons Attribution Sharealike Noncommercial. This license is very open. It allows reuse, remixing, and distribution, but prohibits commercial use and requires any remixes use the same license as the original. This limits where the content can be remixed into, but on the other hand ensures that no-one can remix the content then put the remix under a more restrictive license. The non-commercial clause can make getting printed copies of remixes challenging depending upon how strictly the authors interpret the clause.Formats: PDF. A Portable Document Format (PDF) file is can be opened using the free Acrobat Reader. It is not an editable format.TeX. A TeX file use the TeX or LaTeX typesetting engine. TeX software is available free for most platforms. It is an editable formatOpenness Rating (0-4): 2 1 Understanding the Derivative 1.1 How do we measure velocity? 1.2 The notion of limit 1.3 The derivative of a function at a point 1.4 The derivative function 1.5 Interpreting, estimating, and using the derivative 1.6 The second derivative 1.7 Limits, Continuity, and Differentiability 1.8 The Tangent Line Approximation 2 Computing Derivatives 2.1 Elementary derivative rules 2.2 The sine and cosine functions 2.3 The product and quotient rules 2.4 Derivatives of other trigonometric functions 2.5 The chain rule 2.6 Derivatives of Inverse Functions 2.7 Derivatives of Functions Given Implicitly 2.8 Using Derivatives to Evaluate Limits 3 Using Derivatives 3.1 Using derivatives to identify extreme values of a function 3.2 Using derivatives to describe families of functions 3.3 Global Optimization 3.4 Applied Optimization 3.5 Related Rates 4 The Definite Integral 4.1 Determining distance traveled from velocity 4.2 Riemann Sums 4.3 The Definite Integral 4.4 The Fundamental Theorem of Calculus 5 Finding Antiderivatives and Evaluating Integrals 5.1 Constructing Accurate Graphs of Antiderivatives 5.2 The Second Fundamental Theorem of Calculus 5.3 Integration by Substitution 5.4 Integration by Parts 5.5 Other Options for Finding Algebraic Antiderivatives 5.6 Numerical Integration 6 Using Definite Integrals 6.1 Using Definite Integrals to Find Area and Length 6.2 Using Definite Integrals to Find Volume 6.3 Density, Mass, and Center of Mass 6.4 Physics Applications: Work, Force, and Pressure 6.5 Improper Integrals 7 Differential Equations 7.1 An Introduction to Differential Equations 7.2 Qualitative behavior of solutions to differential equations 7.3 Euler's method 7.4 Separable differential equations 7.5 Modeling with differential equations 7.6 Population Growth and the Logistic Equation 8 Sequences and Series 8.1 Sequences 8.2 Geometric Series 8.3 Series of Real Numbers 8.4 Alternating Series 8.5 Taylor Polynomials and Taylor Series 8.6 Power Series Math 111: Calculus I, Spring 2020 Office/email: RBH 317 / milnikelr Office Hours: Mon 9:30-10:30; Tue 10:00-11:00 & 2:30-3:30; Wed 6:00-7:00; Th 1:30-2:30 (and by appointment!) Room & Time: RBH 311, 12:10-1:00 Monday, Wednesday & Friday, 9:40-11:00 Thursdays in Peirce L09 You all know that Calculus calls on some big ideas and a lot of abstraction and a lot of computational skill. You are all capable of succeeding in this course! But compared to a high school math course, the pace will be much faster. That will mean that you are asked to do a lot of problems outside of class to deepen your understanding and hone your skills. Expectations On Your Time: The Course Catalog suggests that a typical 0.5 unit course will require a minimum of 8 hours per week outside of class. For this course, I would say 8-10 is typical. So you should expect to spend 2-3 hours preparing for each class meeting. This preparation would include working homework problems, writing them up neatly, working practice problems from the textbook, writing up preview activities, reviewing for quizzes and exams, visiting my office hours, visiting the MSSC, and occasionally working on longer writing projects. Build this time into your schedule. Do not assume that you'll find the time to do all of the work for this class in small gaps in your schedule or starting at midnight the night before. Visiting Office Hours: Nobody is asking or expecting you to do this on your own! There is information below about working with peers in the class and getting free drop-in peer tutoring, but I know from over 20 years of college teaching experience that every one of you would benefit from discussions in office hours at some point, and most of you from regular visits. I hope to see all of you before we're too deep into the semester. If you can't make my regular office hours, email me and we'll set up a time. Note: I'm happy to discuss anything with you in office hours, even if it's not Calculus-related, assuming there aren't folks queued up to ask Calculus (or statistics) questions. I love talking about music, my Chicago Cubs, movies, whatever. I'm also happy to discuss more personal matters, if you could use a sympathetic ear. These might be better discussed during an individually scheduled appointment. I want to help and support my students as people, not just as mathematicians. That said, you should be aware that if you mention an incident of discriminatory or sexual harassment or assault that took place on campus, I am legally bound as a College employee to report it to our Office of Civil Rights. They would then contact you, but you would be under no obligation to reply. There are people both on and off campus that you can speak to confidentially, and I would be more than willing to help connect you to resources appropriate to your situation. Drop-in peer tutoring is available at the Math and Science Skills Center (MSSC), open 7-10 Sundays, Tuesdays, and Thursdays. General check-in is in Tomsich 101, but there is often a room designated as "Calc land" for the semester where all of the Calculus students and tutors congregate. As with office hours, I expect that all of you will have occasion to make use of the tutors in the MSSC. Our lead tutor for Calc I this semester is Luke Muther, but any of the Calc tutors should be able to help you with most problems. Textbooks: Our principal text is Active Calculus by Matt Boelkins. This is intended as an online textbook, but print copies are available from Amazon for $20. Syllabus:We will cover most of Chapters 1-4 of the textbook, plus forays into Chapters 5, 6, and 7. There will be several supplemental topics from handouts throughout the course. Course Objectives: Be able to translate between the graphical, numerical, symbolic, and verbal points of view for key topics in the course. Understand the concept of derivative as slope at a point, instantaneous rate of change, and as functional transformation. Understand the relationship between limits and derivatives Be able to find the derivatives of many functions algebraically, without the aid of technology. Be able to evaluate elementary antiderivatives, including ones requiring substitution. Apply derivatives and their properties to solving problems in optimization, elementary differential equations, curve sketching, evaluation of limits. Understand enough of the definition of integral and the Fundamental Theorem of Calculus to be able to evaluate definite integrals using the FToC. Use software appropriately as a tool in solving problems in differentiation, optimization, ... Software.There will be some work done throughout the semester with the aid of the computer algebra system, Maple. The Maple program is available for your use in RBH 311 and Peirce L09, and for use on your personal computer. I will assume no prior knowledge of Maple, so you will learn what you need to know as we go. You are welcome and encouraged to install Maple on your own laptop or desktop if you have one. Daily Homework. As with any math class, homework is where almost all of your learning takes place. Homework exercises to be evaluated will be collected most days in class. The homework may involve some computer exercises but will be mostly hand-written computations and explanations. Your homework should be legible, with problem number and final answer clearly indicated. Explanations should be written in complete sentences. Random math expressions floating in space will receive no credit. Written assignments will be graded holistically (as opposed to problem-by-problem), with completeness, clarity of communication (including legibility!), and apparent effort being paramount. The grades for homework are largely a motivation to do the necessary work, assessing apparent effort more than mathematical understanding. (Understanding is assessed more in writing projects and exams.) You may turn in three daily homework assignments one class meeting late without question or penalty, but no other late work will be accepted without a written excuse from the Dean of Students. Preview Activities: Each section of the textbook begins with a very short introduction, often as brief as a sentence or two, but sometimes half a page, followed by a Preview Activity. I will indicate on the daily schedule page for the class days on which the Preview Activity is to be handed in. These will be graded on a binary (0 or 1) scale, with complete, legible, apparently earnest attempts to work through the activity earning a 1. If you are really stumped on a preview activity, visit my office hours or the MSSC. Failing all else, write a sentence or two about what you tried to do in working the activity, and what is confusing you about that particular part of the activity. If possible, move on to later parts. Projects. Being able to express yourself in writing is important in mathematics, as it is in any other field of endeavor. During the semester you will be asked to write a few short papers on a topic relevant to the class. In many cases, the process of writing a paper has two major components, each of which should constitute about half the work on the paper. The first is to work out the mathematical details of the topic that you have been assigned. The second is to make sense of those mathematical details and to organize them into a coherent narrative. The paper may very well include symbols, computations, and graphs; however, these will need to be accompanied by generous verbal explanations that explain the mathematical ideas. You will be expected to write clearly and coherently, using correct mathematical and English grammar. Academic Honesty. In general, the rules set forth in the 2019-2020 Course of Study apply. Presenting the work of others as your own is strictly prohibited. In the case of homework, you may collaborate with others in discussing how a problem may be solved, but your write-up must be your own. If you submit work that contains the ideas or words of someone else, then you must provide proper citation. Assistance may not be given nor received (other than by the instructor) on any quiz, or exam associated with this course, except where explicitly allowed by the instructor. In the case of a group assignment, all members of the group should contribute equally to writing the final product. And every member of the group is responsible for the content of the entire paper, not just the section(s) that are written by that person. Don't put your name on a paper written by others. For further information, the Mathematics and Statistics Department Guidelines for Healthy Collaboration on Homework are considered as applying to this course. Attendance and Participation: While I do not make attendance and participation part of the grade calculation, in general reading and homework do not take the place of the kind of learning that happens in class with interactions and group activities. Therefore, any student missing more than 10 class days for any reason, excused or unexcused, will be expelled from the course. Once you are in the room, please do not leave and re-enter unless it is an emergency. ("I forgot to print something" or "I was thirsty" are not emergencies.) If you have a medical reason for needing to step out regularly, please inform me before or after class. More information is to be found in the Mathematics and Statistics Department General Policy on Attendance and Tardiness. If you will be missing class due to a planned excused absence, it is your responsibility to inform me in advance and make arrangements to submit any work required for that day before the class. If your absence is excused due to illness or other unforeseeable circumstances, contact me by email when you are able and we will discuss a timetable for making up the missed assignments. We will be working a lot of activities in groups of 2-3 in class, so you'll be interacting with each other quite a bit. Please exercise common courtesy and decency in your interactions with your fellow learners. This includes, but of course is not limited to, making an earnest attempt to use people's preferred names and pronouns. If you feel you are facing a hostile environment in any way, please let me know as soon as you comfortably can. Technology in Class: When you are not working on an in-class activity that is aided by Maple or other use of the computer, I expect you to be logged out of the workstation in front of you. All cell phones should be in pockets or bags and should not be used during class. (In particular, please do not leave your phone sitting on the desk beside you. The temptation to look over at alerts is too great and is a distraction from learning.) There should be no need to use laptop computers in this class, except in cases of documented disability. Seating: I will assign seats, at least for the MWF classes, starting the first full week of the course. These will be randomized, generally rotating once a week, to encourage people to work with a variety of partners on the in-class activities. If there is a reason you should not be assigned to work with a particular individual, please let me know. Quizzes. There will be a short quiz most weeks, usually on Thursday, covering material from approximately the preceding week. The quiz will usually consist of two problems, both drawn from listed practice problems. All textbook exercises are either unlimited-attempt online problems or have complete solutions in an appendix available to you, so generally you will have the bank of possible questions and answers all in advance. Because all questions and answers are available in advance, quizzes may not be made up, but your lowest quiz grade will be dropped. (If you miss due to illness or excused absence, that quiz will be dropped as your "lowest quiz grade" and you will not be penalized.) Tests. There will be four midterms (6 February, 19 March, 9 April, and 23 April), the Gateway Exam (28 February, see below) and a comprehensive final exam (6:30-9:30 p.m. on Wednesday 6 May). The Gateway Exam. The Gateway Exam will consist of seven problems that will test a student's ability to apply differentiation rules correctly without the aid of technology. To pass the Gateway Exam, a student must present flawless solutions to all seven problems on the exam. By "flawless", I mean that a solution must be 100% correct in terms of computation AND presentation. A misplaced equal sign (mathematical verb) or an omitted parenthesis would make a problem incorrect. The Gateway Exam is worth 10% of the final course grade. Since perfect solutions are required, a reasonable number of retakes of the Gateway Exam are permitted according to the following guidelines: Retakes will be of similar format to the first Gateway Exam, but will consist of different problems. A student may take no more than 3 retakes per week, and at most 1 retake in any given day. No student may retake the Gateway Exam after 5PM on the last day of classes. A student who scores perfectly on the Gateway Exam on their first attempt will receive 60 points out of 50 (or an extra 2% for the total course grade) for this portion of the course. A student who passes a retake by the 2nd of April will receive 50 points (i.e., full credit) for this portion of the course. Gateways passed later will receive 25 points. A student who fails to pass the Gateway Exam on all attempts will receive 0 points out of 50 (i.e., no credit) for this portion of the course.   Learning Disabilities. A student with a disability who thinks they may need an accommodation to access a campus program, activity, or service should contact Erin Salva in Student Accessibility and Support Services (SASS) at salvae@kenyon.edu to discuss specific needs. Advance notice is required to review documentation, evaluate accommodation requests and provide notice or arrangements for any accommodation. Grades. Your grade will be based on the daily homework, quizzes, a project, tests as described above, and the final exam. The point totals are as follows: Homework: 50 (10%) Quizzes: 50 (10%) Writing Projects: 50 (10%) Preview Exercises: 20 (4%) Four Midterms: 4 x 40 (32%) Gateway Exam: 50 (10%) Final Exam:120 (24%) --------------------