Mathematics 113 – 005: Analytic Geometry and Calculus I; Spring 2019

Class Schedule:	**Tue & Thu: 2:30 – 4:20 PM**	**Location:**	**Engineering 1101**
Class Dates:	**Tue 22 Jan – Thu 2 May 2018**	**Final exam:**	**THU 9 MAY 1:30 – 4:15 pm in class** **TENTATIVE** *(subject to confirmation by the Registrars Office)*
Instructor:	**Mr. Glenn Preston**	**Email:**	**gpresto3@gmu.edu**
Office:	**Exploratory Hall, Room 4309**	**Office Hours:**	**MW 3:30 – 5:30; TR 12:00 – 2:00; and by appt.**
FRIDAY Recitation Sections:	**Rob B106; 313:** 10:30 – 11:20 am, **314**: 11:30 am – 12:20 pm; **315**: 12:30 – 1:20 pm		
Graduate Teaching Assistant:	**Kiefer H Green**	**Email:**	**kgreen32@gmu.edu**
Office:	**Exploratory Hall, 4307** ***(Collaborative Area)***	**Office Hours:**	**Mon 1 – 2 PM, Tue 11 AM – 12 PM**

Prerequisites:

- Per the Course Catalog: Grade of C or better in Math 105 or requisite score on Math Placement Exam
  - **NOTE:** ➔ you will need to have a SOLID foundation in basic GEOMETRY, ALGEBRA, TRIGONOMETRY, FUNCTIONS, GRAPHING BY HAND, and other miscellaneous topics from Math 105 and prior courses

Textbook and other Required Materials:

- **Thomas' Calculus: Early Transcendentals; Hass, Heil, and Weir; 14th Edition**; Pearson ISBN: 9780134439020 (Book Only); 9780134764528 (MyLab Math Only – eBook); 9780134768496 (BUNDLE: Textbook & MLM Code)
  - **THERE ARE TWO VERSIONS OF THE TEXTBOOK –** you need to figure out which version you need/want
    - Multi-variable version – good for all three Calc classes (113/114/213) - links above are to this version
    - Single-variable version – less expensive but only good for Calc I & II (113/114) – LINK
  - **You do NOT need MyMathLab (MLM)** even though it is listed by the GMU Bookstore as "required" for this course. *(You may find it useful and are welcome to use it, but it is not required and I don't plan to use it.)* **IF YOU BUY THE MLM CODE:** I set up an MLM course and populated the homework assignments. Instructions for logging into the course are posted on our course Blackboard page in the "Course Content / MyLab_Math" folder
- **Access to Mathematica (from Wolfram Research) – IT'S FREE**
  - Free download (V11.3) from the College of Science web page: https://cos.gmu.edu/mathematica/
    - This site also has some links to Mathematica tutorials https://cos.gmu.edu/mathematica/#new-users
  - Use the GMU Computer Lab (Locations) – loaded with Mathematica V11.X (I'm not sure what X =)

Course Learning Objectives:

- **Catalog:** "Functions, limits, the derivative, maximum and minimum problems, the integral, and transcendental functions."
- **Glenn's Additional Objectives:** Prepare you to be successful in future math, physics, science, engineering, and other courses that require analytic geometry and differential calculus; enhance your problem solving skills, intuition, and insight. Also, help you to be an effective and valued employee in your career field someday.

  Major points of emphasis will be to cultivate your skills to:

  - **(1) Analyze problems and solutions** to understand what they mean, how they behave, and when/how they are valid and keep out of trouble when a solution (or technique) is not valid
  - **(2) Do a "sanity check" to see if your answer makes sense** – e.g. does it have the correct properties? Does it fall within reasonable upper and/or lower bounds based on a "ball park" estimate or limiting case?
  - **(3) Graphing** - the name of this course is significant: "**Analytic Geometry** and Calculus I". This is NOT just a calculus course. We will learn fundamental calculus concepts and problem solving techniques and use these as tools to help us **analyze** functions/solutions and determine their **geometric/graphical** properties so that we can graph solutions to gain insight into the problem and solution space.

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Approach: WE WILL EMPHASIZE THE FUNDAMENTALS

- **(1)** Learn how to **diagnose and "attack"** problems to **determine the problem type**, underlying **concept(s)**, appropriate problem solving **technique(s)**, and to master the **mechanics** of executing the solution
- **(2) Proofs and/or derivations of key theorems and techniques** – these are essential for learning and **understanding the "5Ws"** of what we are learning: the **"who, what, when, where, why, and how"** which is what you should focus on. We will do fewer proofs/derivations and generalized problems with parameters than when I took Calculus (i.e. the Stone Age) but more than you are probably used to. It can seem painful but it is worth it.
- **(3)** Include **fundamental concepts and techniques from prerequisite courses** to ensure that you have and maintain a solid foundation in geometry, algebra, trigonometry, functions, logs/exponentials, etc.
- **(4) Emphasize graphing functions/solutions by hand** based on analysis of their properties. For almost any problem, there is an analytical (algebraic) view and a graphical (geometric) view. We'll try to learn both and understand the connection between them. Why? The reason is simple – it forces you to analyze the solution to determine its properties to synthesize a graph. This is a skill that is crucial to being a good problem solver, achieving a deeper understanding of what you are doing, and learning how to properly interpret your results.
- **(5) Word problems** – upper-level courses in your major (e.g. math, science, engineering, physics, economics, etc.) will be full of word problems so you need to get good at them, if not already. **Problem solving is both an art and a science.** Using an organized approach is vital to being a good problem solver. Doing enough problems of a particular type builds your intuition and insight into the best method(s) to "attack" similar problems. There is no substitute for **practice, practice, practice.**
- **(6) Solve problems parametrically –** in applications and in "real world" problems it is crucial to be able to solve a problem in terms of unknown parameter(s) (e.g. density of a fluid or solid, the dimension(s) of a region). This allows you to obtain a GENERAL solution and then evaluate the behavior of your solution as the parameter(s) are varied to understand how the solution behaves (e.g. proportional, inversely proportional, linear, non-linear)

Grades: Course Average Computation and Grade Scale

	Nominal	Max Final	Max Mid-term
3 Mid-term Exams	**45%** *(**All 3** @ 15% each)*	**30%** *(**Best 2** @ 15% each)*	**60%** *(**All 3** @ 20% each)*
2 Mathematica Projects	**10%** (5% each)	**10%**	**10%**
Recitation Quizzes	**10%**	**10%**	**10%**
Final Exam	**35%**	**50%**	**20%**
Extra Credit Diagnostic Inventory	**1%**	**1%**	**1%**

- A course average will be calculated for each student using all three weightings. For each student, on an individual basis, I will use the highest average to determine the overall course grade using the grading scale below.

F (0.0)	D (1.0)	C- (1.67)	C (2.0)	C+ (2.33)	B- (2.67)	B (3.0)	B+ (3.33)	A- (3.67)	A (4.0)	A+ (4.0)	Letter Grade (Grade Points)
< 60	≥ 60	≥ 70	≥ 72	≥ 78	≥ 80	≥ 82	≥ 88	≥ 90	≥ 92	≥ 100	Course Average

- **Grades are based on an absolute scale NOT a "curve".** Your performance will be evaluated relative to what you need to achieve in order to be successful in future courses rather than relative to your classmates' performance.
- **All exams, quizzes, and the two Mathematica projects will have built-in extra credit opportunities**.
- **Speaking of Extra Credit: There are no extra credit assignments or other additional work during or at the end of the semester that can be done to boost your grade.** I still get asked every semester – and the answer is still "no".

QUIZZES & EXAMS – GENERAL INFO:

- **MAKEUP QUIZZES & EXAMS: NONE EXCEPT CONSISTENT WITH GMU POLICY AS STATED BELOW**
  - **Missed quizzes and exams will receive a score of 0. There will be no makeup quizzes or exams except under special circumstances described below.**
  - **Per GMU Academic Policy A.P.1.6.1,** you may be able to take a quiz or mid-term exam at an alternate time **WITH PRIOR ARRANGEMENT**. This applies only to situations involving:

(1) Religious Observance - I have done my best to deconflict the course schedule with religious holidays. However, if the schedule changes or there is a situation/conflict I am not aware of, please let me know.

(2) Mandatory Participation in Official University Activities (e.g. intercollegiate athletics, GMU orchestra)

- My strong preference is to arrange the alternate day/time to be before the quiz/exam is given to the class.
- If you have a conflict, please let me know ASAP. **Last minute requests (< 48 hours) will not be considered regardless of circumstances**. Planning ahead is an important survival skill in the "real world".
- **If you have truly extraordinary circumstances – see me**. I'll listen, but it needs to be a very good reason.

- **NO NOTES OR REFERENCES:** All exams and quizzes will be closed book. No notes or other reference material of any kind will be allowed. I **may** provide a reference sheet with some formulas, but most formulas, theorems, etc. I expect you to know and/or be able to rederive. I will let you know prior to the exam what, if any, reference material/formulas will be provided.
- **NO CALCULATORS OR ELECTRONIC DEVICES OF ANY KIND WILL BE ALLOWED DURING EXAMS AND QUIZZES**. Please turn-**off** (not just vibrate mode) and put away all cell phones, mp3 players, and any other electronic devices during quizzes and examinations.
- **NO LEAVING THE ROOM AND RETURNING**: If you leave, you're done and need to turn in your exam or quiz.

QUIZ-SPECIFIC INFORMATION:

- **There will be a ~15 min quiz in each of the 14 weekly recitations.** However many quizzes we have, say "N", I will divide your total by $N - 2$ to get your quiz average (➔2 are extra credit ➔ nominally $\approx 15\%$ built-in extra credit).

EXAM-SPECIFIC INFORMATION:

- **On all exams, regardless of topic, I will be looking for you to demonstrate:**
  1) **Good problem solving skills:** The ability to DIAGNOSE a problem to determine the type of problem, recognize and understand the FUNDAMENTAL CONCEPT(S) INVOLVED, determine and properly apply the APPROPRIATE PROBLEM SOLVING TECHNIQUE(S), and correctly EXECUTE THE MECHANICS of those technique(s)
  2) **Correct analysis, understanding, and interpretation of the solution:** For example:
     - Analyzing the properties/behavior of a solution to understand what it means, seeing if the solution passes a "sanity check" and/or estimating upper and/or lower bounds for the answer
       - Does the solution increase/decrease appropriately as a function of the variables and parameters?
       - Examine "limiting cases" (i.e. as parameters and/or variables go to 0 or ∞, etc.).
     - Does the solution match given conditions and/or satisfy physical constraints of the problem?
     - Is the solution defined over the appropriate domain and does it produce the appropriate range?
     - Estimate "ball park" values using simpler conditions (e.g. round numbers, simpler curves/shapes)
  3) **Ability to graph/sketch the solution** – use calculus and other techniques to deduce properties of the solution and correctly draw it; relate the graphical behavior of the solution to expected results based on the type of problem, specified conditions/parameters, physical constraints, etc.
  4) **A well-organized solution with a mathematically correct progression from each step to the next**
     - **SHOW YOUR WORK ➔ LITTLE OR NO WORK = LITTLE OR NO CREDIT REGARDLESS OF YOUR ANSWER.** Don't leave large gaps between steps, be careful with use of an equal sign ➔ both sides must truly be equal or else it is an incorrect statement; be careful to use correct notation.
     - **WHAT YOU WRITE DOWN MATTERS** - even if you understand what you are doing, you need to properly communicate that understanding to me (and later to coworkers, customers, your boss, etc.)
- **Regardless of the chapter/topics, each exam will have at least one or more problems involving:**
  - **Word problem(s)** and/or physical application(s)
  - Some form of **transcendental function(s)** (e.g. trig and/or inverse trig functions, log and exponential functions)
  - **Parametric values** and analysis of how solutions behave relative to the parameters of the problem
  - **Application of fundamentals:** geometry, trigonometry, and algebra concepts and techniques
  - **Graphing** of function(s) and/or solution(s)

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COMPREHENSIVE FINAL EXAM:

- The emphasis will be on key concepts/techniques, particularly putting them together to solve "compound" problems, applications, and understanding of the "big picture" and "the 5W's"
  - **IMPORTANT NOTE:** Per GMU Policy A.P.3.10, you must take the final exam at the regularly scheduled date and time unless you have **excused absence in writing signed by your Dean or Academic Director.**
  - GMU policy allows you to arrange an alternate day/time if you have a conflict between final exams or more than two final exams on one day. If so, **let me know SEVERAL WEEKS PRIOR to the final exam.**

Homework Exercises:

- **WORD TO THE WISE: If you don't do a thorough and comprehensive job on the homework exercises, you will almost certainly fail the course – it is that simple. Many have tried (myself included) to short-change the homework process and it always ends VERY badly. Don't learn this lesson the hard way.**

Mathematica Projects:

- **There will be two Mathematica projects.** The first will be due between Exam-1 and Exam-2 and the second will be due between Exam-2 and Exam-3 (see class schedule for specifics).
- **VERY IMPORTANT INFO RE: THE TWO PROJECTS**
  - They are due **in Blackboard** no later than (NLT) 11:59 PM on the date specified on the course schedule. The due dates/times are absolute – THERE WILL BE NO EXTENSIONS UNDER **ANY** CIRCUMSTANCES.
    - Projects submitted $\geq$ **24 hours prior to the deadline** will receive a **10% bonus**.
  - **DO NOT PROCRASTINATE** – make sure that you gain access to Mathematica immediately and try it out SOON to learn the basics and be able to estimate approximately how long you think it will take to do the projects.
  - I will grade the projects solely based on the mathematical content/quality and not on programming skills.

Class Web Page/Communication:

- I will post all class materials, announcements, scores/grades on **Blackboard** and send some things via GMU email.
- **The primary way to contact me is via GMU email (gpresto3@gmu.edu)**
  - To comply with GMU policy and protect your privacy, I will try to only send email to your GMU email address. **Please only send email to me from your GMU email so I can use the "reply" function in responding to you**.
  - I will try to reply to each email ASAP, but please bear in mind that with 130 students between 2 classes it may not be right away. In case of emergency you can text me at (703) 405-0344 (text only please, no calls)

Honor Code: THIS IS VERY IMPORTANT

- **It is expected that each student in this class will conduct himself or herself within the guidelines of the Honor Code.** Among other things, this means that sharing information of any kind about exams or quizzes (either before or during the exam) is forbidden. Any alleged issues related to the honor code will be brought to the attention of the Office of Academic Integrity. Please reread the University Honor Code and abide by it.

Other Topics:

- **Class Schedule:** The last page shows the nominal schedule for lecture topics, quizzes, exams, etc. Modifications to the schedule may be required. **You are responsible for being aware of any announced, emailed, and/or posted changes. Please check the syllabus before asking "what is on the quiz this week?"**
- **Attendance: Will not be taken and there is no "participation" component to your grade.** It is your choice/responsibility to show up for class, be prepared, and get something out of it. **REGARDLESS, IT IS VITAL THAT YOU KEEP PACE WITH THE COURSE SCHEDULE.**
- **Electronic devices: Please be courteous and silence all cell phones, pagers, iPods, and other devices during class.** You may use a laptop, smartphone, or other electronic device for capturing notes or other legitimate class related use (but NOT during an exam or quiz).
- **University Policies:** Please familiarize yourself with university policies. The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct

in university academic affairs. All members of the university community are responsible for knowing and following established policies and procedures. (See also https://catalog.gmu.edu/policies/)

Getting Help: Don't Let a Small Problem Turn into a big one ➔ DON'T GET BEHIND

- **Contact me** via email and/or come see me during regular office hours or make an appointment.
- **The Math Tutoring Center**, Johnson Center, Room 344: http://math.gmu.edu/tutor-center.php
- **Find a buddy and/or form a study group** – There is nothing wrong with working collaboratively. However, just make sure that you don't simply "go along for the ride" when working with someone. **Watching someone else do a problem – even if you understand what they are doing – is not the same as doing it yourself**
- **Internet Resources:** There are tons of good resources out there (and a lot of crap too). I like:
  - **Class notes by Paul Dawkins** (Lamar University)
    - These are tutorial in nature, quite readable, and the topics covered are nearly identical to the ones we cover in our course. You can view these notes on-line and/or download PDF files (whole course, by chapter, or by selected topic(s)) http://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx
  - **The Khan Academy Tutorials**
    - In general I find Khan Academy videos to be good. They have several ways of bundling Calc courses for HS and college. Here is a link to their "Calc 1"course: https://www.khanacademy.org/math/calculus-1
  - **MIT Open Courseware (OCW)**
    - There are several versions of courses covering various flavors of single-variable calculus with varying degrees of theory. Here is a link to the MIT OCW calculus page: http://ocw.mit.edu/courses/find-by-topic/#cat=mathematics&subcat=calculus
  - **Mathematica Demos**
    - http://demonstrations.wolfram.com/ There are over 500 interactive calculus demos: http://demonstrations.wolfram.com/topic.html?topic=Calculus&limit=20
    - Some demos are pretty good and some are pretty arcane and/or nerdy. I will use Mathematica to help us visualize problems and solutions, and I will post the files on Blackboard.

Other University Resources and Links:

- **Office of Disability Services** (ODS): Student Union Building I, Room 211, (703) 993-2474**. All academic accommodations must be arranged through ODS**. If you are a student with a disability and need academic accommodations, please contact ODS as soon as possible and do not hesitate to speak confidentially with me.
- **Counseling And Psychological Services** (CAPS): Student Union Building I, Rm 3129, (703) 993-2380
- **Veterans: Office of Military Services:** SUB I, Suite 1510 (next to Chik-Fil-A) , (703) 993-1316
- **Mathematical Sciences Department**: Exploratory Hall room 4400, (703) 993-1460

My Commitment to You:

- So far all of the rules/policies have been imposed on you. However, you have a right to expect certain things from me. I have responsibilities to each student and to the class as a whole. My commitment to the class is that I will:
  - Do my best to follow my own advice/rules and lead by example – i.e. I will try to "practice what I preach"
  - Be as honest, open, and transparent as possible in how I conduct the class, consistent with maintaining proper student privacy/confidentiality and the academic integrity of the course.
  - Treat every student with respect and as an individual having individual talents and needs, within the constraints of doing what is best for the class as a whole. Everyone learns a little differently and some students need more and/or different types of help than others.
  - **Bottom line:** To be successful in this course you will need to do more than just the bare minimum. Therefore, **I** am ready, willing, and able to do more than the minimum required of me *(e.g. extra office hours, review sessions, provide supplemental material, whatever I can do to help students realize their potential).* I will help you in any appropriate way, however, **just remember that you learn by doing and "only you can do the doing"**.

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***** Class Lecture/Exam/Quiz Schedule (Subject to Change) *****

Unless there are class cancellations we will stick to this schedule. Quizzes and exams will cover scheduled sections regardless of how much of any particular chapter section we cover during each lecture.

Course Schedule

	TUE Lecture	THU Lecture	FRI Recitation
1	22 JAN	24 JAN	26 JAN
	Intro, 1.1, 1.2	1.3, 1.5, 1.6	QUIZ: 1.1 - 1.6
2	29 JAN	31 JAN	1 FEB
	2.1, 2.2	2.2, 2.3	QUIZ: 2.1, 2.2
3	5 FEB	7 FEB	8 FEB
	2.4, 2.5	2.5, 2.6	QUIZ: 2.4, 2.5
4	12 FEB	14 FEB	15 FEB
	2.6, Review	EXAM-1: CH 1 - 2	QUIZ: 2.6
5	19 FEB	21 FEB	22 FEB
	3.1, 3.2	3.2, 3.3	QUIZ: 3.1, 3.2
6	MATHEMATICA PROJECT #1 DUE NLT 11:59 PM MONDAY 25 FEB		
	26 FEB	28 FEB	1 MAR
	3.4, 3.5	3.5, 3.6	QUIZ: 3.3 - 3.5
7	5 MAR	7 MAR	8 MAR
	3.7, 3.8	3.8, 3.9	QUIZ: 3.6 - 3.8
8	12 MAR	14 MAR	15 MAR
	SPRING BREAK – NO CLASSES		
9	19 MAR	21 MAR	22 MAR
	3.10, 3.11	3.11, Review	QUIZ: 3.9 - 3.10
10	26 MAR	28 MAR	29 MAR
	EXAM-2: CH 3	4.1, 4.2	QUIZ: 3.11
11	2 APR	4 APR	5 APR
	4.2, 4.3	4.4, 4.5	QUIZ: 4.1 - 4.3
12	MATHEMATICA PROJECT #2 DUE NLT 11:59 PM MONDAY 8 APRIL		
	9 APR	11 APR	12 APR
	4.5, 4.6	4.7, 4.8	QUIZ: 4.4 - 4.6
13	16 APR	18 APR	19 APR
	4.8, Review	EXAM-3: CH 4	QUIZ: 4.7, 4.8
14	23 APR	25 APR	26 APR
	5.1, 5.2	5.2, 5.3	QUIZ: 5.1, 5.2
15	30 APR	2 MAY	3 MAY
	5.4, 5.5	5.5, 5.6	QUIZ: 5.3 - 5.5

COMPREHENSIVE FINAL EXAM
THU 9 MAY 1:30 – 4:15 PM
ENGINEERING 1101 (classroom)

Homework Exercises (x – y = ODD ONLY; *Even in Red*)

Ch	Title	Exercises
	CHAPTER 1: FUNCTIONS	
1.1	Functions and Their Graphs	*4*, 5, 9, 11, 19 – 25, 29, 37 – 41, 49 – 55, 63, 67, 69, 75
1.2	Combining Functions; Shifting & Scaling Graphs	9-13, 17, 19, 25, *26*, 27, 29, 49 – 55, 69 – 77
1.3	Trigonometric Functions	1-19, 31, 33, 39, 41, 47 – 53, 57, 61
1.5	Exponential Functions	5 – 23; Solve ANALYTICALLY, use graph to verify: 29-35
1.6	Inverse Functions and Logs	11 – 23, 27 – 33, *38*, 45, 49 – 53, 65 – 73
	CHAPTER 2: LIMITS AND CONTINUITY	
2.1	Rates of Change and Tangent Lines to Curves	1 – 11, 15, 19, 21, 25
2.2	Limits of Functions, Limit Laws	1 – 9, 19 – 27, 35, 37, 47 – 53, 57, 59, 63, 65, 73
2.3	Precise Definition of a Limit	1, 3, 7 – 17, 25, 29 – 33, 39, 43, 49, 53, 57, 61
2.4	One-Sided Limits	1 – 7, 15 – 19, 23 – 27, 41, 43, 47, 49
2.5	Continuity	5 – 17, 29, 33 – 35, 41 – 47, 53, 57, 65, 77
2.6	Limits Involving Infinity; Asymptotes of Graphs	1 – 11, 17 – 27, 37, 39, 49, 53, 57, 63, 67 – 71, 87, 107, 111
	CHAPTER 3: DERIVATIVES	
3.1	Tangent Lines and the Derivative at a Point	1 – 13, 25 – 31, 35, 39, 41
3.2	The Derivative as a Function	1, 7, 9, 17, 21, 23, 27, **28**, 29, **30**, 33-41, 45-49, 55, 59
3.3	Differentiation Rules	7 – 13, 17, 23 – 31, 41, 45, 53 – 59, 65, 69, 77a, 79
3.4	Derivative as a Rate of Change	1, 7, 9, 11, 17, 21, 23, 27, 31, 33
3.5	Derivatives of Trigonometric Functions	1 – 7, 13, 15, 27, 29, **34**, 35 – 41, 47, 53, 55, 61, 63, 71
3.6	The Chain Rule	3, 5, 9, 15 – 21, 33, 35, 41, 43, 61, 65, 67, 71, 79, 87, 97
3.7	Implicit Differentiation	1, 7 – 11, 15 – 23, 27, 31, 35, 39, 43, 45, 49, 51, **54**
3.8	Derivatives of Inverse Functions & Logarithms	3 – 15, 27 – 33, 41, 43, 47, 55, 57, 73, 75, 83, 85, 93
3.9	Inverse Trigonometric Functions	1 – 5, 11 – 17 , 21 – 25, 33 – 37, 47, 55, **56**, **58**, 63, 65
3.10	Related Rates	1, 5 – 13, 17, 21, 23, 27, 31, 33, 37
3.11	Linearization & Differentials	1 – 5, 9 – 13, **18**, 19 – 25, 39, 45 – 49, 53, **56**, 65
	CHAPTER 4: APPLICATIONS OF DERIVATIVES	
4.1	Extreme Values of Functions on Closed Intervals	7, 11 – 17, 23, 27, 31 – 37, 41, 47, 49, 53, 57, 59, 63, 73, **76**
4.2	The Mean Value Theorem	1 – 5, 9 – 13, 21, 25, 31 – 39, 43, 45, 51 48, 52, 54, 56, 77
4.3	Monotonic Functions and the First Derivative Test	7 – 21, 41 – 45, 53 – 57, 61 – 65, 69, 71, 77
4.4	Concavity & Curve Sketching	1 – 5, 11 – 17, 23, 25, 31, 43, 51, 53, 57 – 61, 71, 85, 87, 103, 117
4.5	Indeterminate Forms and L'Hôpital's Rule	1 – 5, 9 – 15, 37, 41, 49 – 55, 63 – 69, 81, 85
4.6	Applied Optimization	1 – 9, **12**, 15, **24**, 27, 29, 33, 45, 49, 57, 73
4.7	Newton's Method	1, 5, 9, **10**, **12**, **14**, 17, **22**, 23, 32a
4.8	Antiderivatives	1 – 7, 13 – 23, 29 – 35, 53 – 57, 83, 85, 89, 91, 97, 129
	CHAPTER 5: INTEGRALS	
5.1	Area and Estimating with Finite Sums	1 – 7, 11 – 15, 19, 21
5.2	Sigma Notation and Limits of Finite Sums	1, 3, 7, 9 – 15, 19, 25, 30, 37, 39, 41 – 45
5.3	The Definite Integral	1 – 5, 9, 11, 15, 17, 31 – 35, 45 – 49, 55 – 59, **64**, 73,79
5.4	The Fundamental Theorem of Calculus	1, 3, 7 -15, 23, 25, 29, 31, 35, 41 – 47, 61, 63, 73, 77
5.5	Indefinite Integrals and the Substitution Method	3, 5, 11, 15 – 21, 29 – 39, 51 – 55, 61, 67, 71, 73
5.6	Definite Integral Substitutions and the Area Between Curves	1 – 5, 13 – 17, 25 – 31, 49 – 53, 67 – 71, 75, 77, 87, 91, 113, 115