

General Course Information for MA 153, MA 154 and MA 159

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1. ***College Algebra and Trigonometry* at IPFW**

As part of a nationwide movement and endorsed by the Mathematical Association of America, the Department of Mathematical Sciences has changed its approach to teaching College Algebra to one which is leaner, livelier, and more relevant to real-life problems. (See the guidelines at the Web Site <http://www.maa.org/cupm/crafty/CRAFTY-Coll-Alg-Guidelines.pdf> and the urgent call at the Web Site http://www.maa.org/t_and_l/urgent_call.html) The main purpose of this fresh approach is to help you learn to think about mathematics. The text, as you will see, emphasizes understanding concepts and de-emphasizes rote memorization. Since our goal is to prepare you for further study in all mathematical subjects, there will be a strong emphasis on mathematics in everyday life and many of the applications will come from the physical and social sciences.

In addition to the text, we will be using graphing calculators to help us better visualize ideas and to find the solution to problems which cannot be solved by pencil and paper.

In this course there is an emphasis on cooperative learning. Your instructor will be facilitating group activities and discussion rather than just repeating the content of the text to you at the blackboard. This means that we will be asking you to read the material and attempt the homework before it is "covered" in class. There will be times when you will have to learn topics which will not be formally discussed in the classroom.

You will be cooperating with other students; not competing. Your course grade will depend on achievement and effort, and there is no limit to the number of students who can receive good grades in this course.

We are excited about this new approach to teaching and learning mathematics, and we hope that you will join us in this excitement. Have a good semester!

2. **The Course Goals for *College Algebra and Trigonometry***

- Highlight the link of mathematics to the real world.
- Develop a wide base of mathematical knowledge, including
 - basic skills and concepts,
 - a functional view of mathematics, including graphical, algebraic, numerical, and contextual viewpoints,
 - properties and applications of some of the basic families of functions
 - geometric visualization,
 - problem solving, predicting, critical thinking, and generalizing.
- Incorporate the use of general academic skills such as
 - communicating mathematics concepts,
 - understanding and using technology, and
 - working collaboratively.

3. Course Descriptions

MA 159 (5 credits) presents the concepts of *Precalculus* or *College Algebra and Trigonometry* from four points of view: geometric (graphs), numeric (tables), symbolic (formulas), and written (verbal descriptions). Note: MA 159 was formerly MA 151. The emphasis is on the mathematical modeling of real-life problems using linear, polynomial, exponential, logarithmic, trigonometric, and rational functions. Topics also include vectors, conic sections, and complex numbers. Students develop their reading, writing, and questioning skills in an interactive classroom setting.

The sequence MA 153 - MA 154 (3 credits each) is a two semester version of MA 159. If it has been quite a long time since you've had algebra or trigonometry (or if you have never taken trigonometry), it may be wise to take the two semester sequence. Any degree program which requires MA 159 will accept credit in successful completion of both MA 153-MA 154.

4. Prerequisite Skills

MA 153, MA 154, and MA 159 are intended for students who have completed two years of high school algebra. The prerequisite for MA 153 or MA 159 is completion of *Intermediate Algebra* MA 113 with a C or higher or placement by departmental exam. The prerequisite for MA 154 is MA 153 with a C or higher or placement by departmental exam. It is assumed that you are proficient in many of the skills mentioned in the sections of the text called Tools.

Before enrolling in this course, you are expected to be able to:

1. Use algebraic symbols and notation to make meaningful statements.
2. Solve applications for which linear equations, quadratic equations, and systems are mathematical models.
3. Solve the following equations algebraically:
 - a. Quadratic with real solutions.
 - b. Absolute value of the form: $|ax + b| = \text{constant}$.
 - c. Fractional leading to a quadratic.
 - d. Polynomial of degree higher than two by factoring.
 - e. Radical leading to linear or quadratic.
4. Solve linear inequalities algebraically, write the solution set in interval notation, and graph the solution set on a number line.
5. Solve a system of two linear equations in two variables (having no, one, or many solutions) by graphing, substitution, or elimination
6. Apply properties of exponents with exponents that are positive or negative integers or rational.
7. Perform arithmetic operations (addition, subtraction, multiplication and division) with radicals (excluding rationalizing).
8. Solve problems where involving basic geometric concepts including the Pythagorean Theorem, formulas for area and perimeter of rectangles, squares, triangles, and circles.
9. Perform the following activities with lines:
 - a. Use the distance and midpoint formula.
 - b. Graph equations in standard form and slope-intercept form.
 - c. Compute the slope given two points.
 - d. State the slope given an equation.
 - e. State if lines are parallel or perpendicular from given information.
 - f. Write the equation of a line given its slope and another point or if given two points
10. Use a graphing calculator to enter a function, explore its inputs and outputs in a table, and find an appropriate viewing window to display the key features of its graph.
11. Understand function notation.
12. Complete the square to find the vertex of a parabola.
13. Graph a circle if given its equation in standard form.

Take a look at the following kinds of problems. If they do not look familiar, perhaps you need to drop the class and take either the prerequisite *Intermediate Algebra* MA 113, or its prerequisite, *Elementary Intermediate Algebra* MA 109.

Check Your Understanding: p 53-54: 1, 6, 9, 10, 18, 20, 21, 23, 26, 28, 29, 30, 32, 32, 33, 34, 39-45

Tools for Chapter 1: p 55-60

Solve a linear equation: 1-25 odd

Solve a system of two linear equations: 33-43 odd

Tools for Chapter 2: p 99-104

Expand Algebraic Expressions: 1-25 odd

Factor Algebraic Expressions: 29-65 odd

Solve a Quadratic Equation By Factoring: 77-95 odd, 99, 101

Solve Equations By Raising Both Sides to a Power: 83, 105

Tools for Chapter 3: p 146-149

Work with Positive Integer Exponents: 1-23

Work with Rational and/or Negative Exponents: 25-43 odd, 78-86

Work with Radical Expressions: 45-55 odd, 61-75 odd

Solve Equations: 87-91 odd

Understand Laws of Exponents: 95-111 odd

Tools for Chapter 5: p 239-242

Change the Form of an Expression by Completing the Square: 1, 4, 13-17 odd, 19, 23, 27

Solve a Quadratic Equation Using the Quadratic Formula: 37-41 odd

Use the Best Strategy to Solve a Quadratic Equation: 43-55 odd

Tools for Chapter 9: p 441-445

Work with Fractions: 1-13 odd, 27, 33, 63-67 odd

Work the above suggested problems to make sure you have the tools you need to succeed.

Note: The answers to the above suggested even problems on Check Your Understanding: p 53-54 are:

6. True 10. False (100 angels can dance on the head of a pin whose area is 10 sq. mm.) 20. True 26. False $y = -3x + 2$
28. False. $y = 4x + 5$ doesn't pass through $(-2, 3)$ but $(-2, -3)$. 30. True $f(2) = -4 + 7 = 3$. 32. False. $y = 4(x+1) + 5 = 4x + 9$.
34. True. 40. True 42. True. 44. True.

5. Why We Use a Team Approach

You can only use what you remember!!

People remember:

- ~10% of what they read
- ~26% of what they hear
- ~30% of what they see
- ~50% of what they see and hear
- **~70% of what they discuss with others**
- **~90% of what they say as they do something**

You can prepare for the "real world" of work.

Here's what a principal aerodynamics engineer from The Boeing Company and members of the Washington State Software Alliance have to say.

What do we look for in employees? We hire those who have demonstrated that they:

- Enjoy the process of learning & know how to learn independently
- Thrive on intellectual challenges
- Are creative and flexible in how they solve problems

- Have a good understanding of the fundamentals (mathematics, science, economics)
- Can manage knowledge and information, as well as tasks and things
- **Can operate effectively in a team environment**
- **Have good communication skills**

Team Roles

Effective groups are organized and have clearly defined roles for its members. Group roles could include:

Manager - encourages all members of the group to participate in the discussion, sharing their ideas, as well as quiets down someone if he or she is doing too much of the talking, e.g., "I think the group understands what you've been saying; we need to hear some other ideas." Makes sure everyone is contributing and understanding. If the team has only three members, or if one of the four members cannot attend, the manager should also take one of the other roles.

Reader - reads the problem aloud to the group.

Scribe - writes up the group's solution to the problem for presentation to the class. Whenever possible, solutions should include symbolic, graphical and verbal explanations or interpretations. Diagrams and pictures should also be provided if possible.

Clarifier - assists the group by paraphrasing the ideas presented by other group members, e.g. "Let me make sure I understand, the graph goes up ...". The clarifier is responsible for making sure that everyone in the group understands the solutions to the problems.

Other roles include the **Skeptic** and the **Quality Controller (or Checker)**, which could be taken by the Reader or Scribe, depending on the task.

6. Reading the Text

In this course, it is absolutely essential that you do the reading assignments. Your experience with previous math courses may make it seem unlikely, since it may have been possible to avoid reading the text, yet do adequately well by copying down examples the instructor did in class and then doing the homework exercises by just changing the numbers in those "pattern examples" and the pattern examples given in the text. Also, older-style texts subtly encouraged students to skip the reading assignments by putting procedures for doing exercises in boxes, thereby essentially telling the students that "everything you really need to know to do the exercises can be found inside the boxes; you might as well skip reading everything else."

This approach resulted in some students being able to do the mechanical computations quite well, but having no real understanding of the material and no real ability to apply it in situations that are even a little bit different from that covered by the pattern examples. In essence, students were only being programmed like computers to do computations that computers can do faster and more accurately anyway. It is this deficiency in the old-style math courses that led to the national movement toward reformed courses, like this one, which stress understanding. This modern approach to learning requires new methods in the classroom emphasizing learning rather than lecturing, as well as new texts such as the one for this course.

The difference between the text for this course and an old-style math text is apparent from even a cursory scanning of the first chapter. If you open the text and just begin turning pages, you will probably be struck by the following:

1. The amount of text to be read outside of examples is much greater than in old-style books. Older books would typically have brief explanations, sometimes single paragraphs, followed by one or more pattern examples. This book has longer explanations that attempt to convey understanding of the concepts involved rather than just the mechanics of how to do computations.
2. The examples tend to be much longer than those in an old-style text, and they often arise from actual real-world problems.
3. The exercises, which also tend to be much longer than those in an old-style text, are often quite different from each other and from the examples in the text, and use real-world numbers that are not as "nice" as the made-up numbers in the shorter exercises typical of old-style texts.

Doing the exercises requires an understanding of the material in the text, not just the ability to change numbers in pattern examples. Also, your instructor will be counting on you to read the text, since he or she will not be lecturing very much and will be relying on you to have seen the material before you work with it in class. Like other courses outside mathematics (but perhaps unlike other mathematics you have taken), not every small point on which you will be tested will be covered by in-class examples. Since the reading is so very important, some hints on how to do it might be helpful. You may find that slight variations on the following scheme will work well for you.

- a. Plan to do the reading more than once, and do not make it an essential goal to understand everything in the reading the first time through it. The first reading should be devoted only to getting a general overview of the material in the section.
- b. After the first reading, stop for a few minutes and attempt to summarize to yourself, in your own words, what the section is all about. Then immediately re-read the section.
- c. During the second reading, make a serious effort to understand *all* of the material in the section. This does *not* mean to memorize it, but rather to understand all of the points before going on.

If you do not understand something during the second reading, put the book aside awhile and return to it later when your mind is fresher. If you still do not understand it after returning to it, ask your instructor or your group members about it. *Do make sure you eventually understand all of the material. You will probably get tripped up in later reading, in doing the homework, or on test if you treat material you don't quite understand as "probably not all that important."*

7. Study Time

This course requires a solid effort. The faculty at IPFW expect you to study a minimum of 6 hours a week outside of class working on mathematics for MA 153 or MA 154 and 10 ten hours per week for MA 159.

8. Calculator

You will be required to use a graphing calculator for activities and assignments in and out of class. This is not optional. The Department of Mathematical Sciences Web Page (<http://www.ipfw.edu/math/>) maintains an *Assistance with Graphing Calculators Website* (<http://www.ipfw.edu/math/resources/calculators.shtml>) which can help you obtain and use a graphing calculator. The TI-83, TI-83 Plus or TI-84 Plus is strongly recommended. You may use another equivalent calculator* but you will be responsible for understanding how to use it. Your instructor will be most familiar with the TI-83 or TI-83 Plus and may not be able to offer you help with other calculators.

*Your calculator should have features which enable you to find intersection points, zeros (or roots), and maximum/minimum points of graphs. The TI-81 cannot do this, but your instructor can give you a calculator program that you can manually type in so that you have this feature. For a list of approved calculators and their prices in Fort Wayne, see <http://www.ipfw.edu/math/resources/lowestprice.shtml>. If you have questions whether your model of calculator is allowed, ask your instructor.

Graphing Calculator Loan Program: You can rent a TI-83 or TI-83 Plus for the semester for only \$10 from the Indiana University Purdue University Fort Wayne Students' Government Association (IPGSA), located in the Walb Student Union Room 225 (481-6586). You get the TI-83 calculator, manual, and unit-to-unit link cable for the entire semester. You must return the calculator at the end of the semester in the same condition you received it or your grades will be encumbered. Supplies are limited and are usually depleted the first week of classes. However, some students may have dropped a class which requires a calculator so one could just be sitting here on a shelf waiting just for you.

9. Your Responsibilities as a Class Member

Since much of the learning in this course occurs interactively during class time, attendance is vital. You are expected to not only attend all class meetings, but participate in your group and contribute to the learning environment of the class as a whole. In particular, the following is expected:

- The classroom is place where all students need to be engaged in learning. This means that it cannot be a place for casual conversations, reading the newspaper, doing homework for other classes, etc. Be ready to concentrate on math and discuss the day's material.
- Be respectful and polite. Listen to your instructor and your fellow students when they are talking.
- In order to benefit from being in an interactive class, each student must come to class prepared. Come to class having done the assigned reading and attempted the homework problems. Contribute to your team.
- Be in your seat and ready to start when your class is scheduled to begin and remain until the class is dismissed.

10. Internet Resources and your IPFW Computer Lab Account

If your instructor has their own Web Page, be sure to go there first. In addition, you might find some of the following links useful:

- The MA 153 Course Web Page: <http://www.ipfw.edu/math/courses/ma153.shtml>
- The MA 154 Course Web Page: <http://www.ipfw.edu/math/courses/ma154.shtml>
- The Department of Mathematical Sciences Web Page: <http://www.ipfw.edu/math/>

Student-access computer labs are located in Kettler 204A, Kettler 217, Kettler 217D, Neff B71, Helmke Library, ET 305, Science G15, and Walb 221. To do so you must have an activated IPFW computer Lab Account, which you received when you enrolled. If you no longer have your activation packet (which was mailed to you), go immediately to the Help Desk at Kettler 206 with a picture ID to obtain a new packet.

11. WileyPlus and electronic resources

For additional practice on homework you can use the Wiley Plus online homework system can be found at <http://www.ipfw.edu/math/resources/wileyplus.shtml> which immediately grades your answers and provides worked-out solutions. This software is accessible from any Web access point.

For students who purchased a new text*, the **registration code is included at no extra charge.**

Once you register, you can access practice questions and tutorials, as well as the electronic form of the text, the student's solution manual, and the graphing technology guide. If you did not purchase a new text, you can purchase a registration code for \$53.95 online at www.wileyplus.com.

***Bookstore alert:** Students who buy the new edition of the text and use the WileyPlus code cannot return the book for a full refund in the first two weeks. This may only affect you if your schedule changes and you wish to drop the class.

12. Help!

So you're working your hardest and reading the book. You're doing the assignments and studying every night. But it's just not enough! Where can one find some extra help?

<p>Suggestion 1: Read the book. Really, really read it. Sit down and read it. Carefully. Again and again. It's truly an excellent book.</p> <p>Suggestion 2: Do lots of individual homework. Understanding material in later chapters typically requires that you understand concepts in previous ones.</p> <p>Suggestion 3: Recopy your notes.</p> <p>Suggestion 4: Problem solving requires persistence. If you don't understand something the first time, you're in good company. Even Einstein had trouble and said, "Do not worry about your difficulties in Mathematics. I can assure you mine are still greater." Don't just give up. Take a break and come back and try again!</p> <p>Suggestion 5: Remember, there's no substitute for daily preparation. Get help as soon as any problems arise. Which takes you to the second column of resources....</p>	<p>Resource 1. Talk to your instructor. Use the office hours.</p> <p>Resource 2. Use the common office hours (schedule forthcoming) of other instructors who teach the same course.</p> <p>Resource 3. If you can, meet with your group members outside of class and do your homework together. If this isn't possible, talk with them as soon as you get to class about any assigned problems that gave you trouble.</p> <p>Resource 4. Use the Center for Academic Support and Advancement (CASA) for tutoring or use drop-in tutoring in Kettler G21.</p> <p>Resource 5: Use the Web, starting first with the Internet resources listed in this handout.</p>
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