

# General Course Information for MA 153, MA 154 and MA 159 Spring 2006

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

As part of a nationwide movement, the Department of Mathematical Sciences has changed its approach to teaching mathematics to one which is "leaner, livelier, and more relevant to real-life problems." 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 the fundamental ideas, to do routine computations, and to make the course more interesting.

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 in problem solving, 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. 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 52-54: 1, 6, 9, 10, 18, 20, 21, 23, 26, 28, 29, 30, 32, 32, 33, 34, 39-45

**Tools for Chapter 1:** p 54-58

Solve a linear equation: 1-25

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

**Tools for Chapter 2:** p 94-99

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 139-142

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, 61-75 odd

Solve Equations: 87-91 odd

Understand Laws of Exponents: 95-104

**Tools for Chapter 5:** p 227-229

Change the Form of an Expression by Completing the Square: 1, 4, 13-17, 19, 22, 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 430-433

Work with Fractions: 1-13, 27, 33, 62-66

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 52-54 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.

You can practice some of these prerequisite skills using *e-Grade*, a Web-based online homework and tutorial system, by going to the Web Site <http://www.ipfw.edu/math/courses/egrade.html>. See Section 11 of this course packet for directions on how to use *e-Grade*.

## 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/graphcalc.html>) 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/lowestpriceintown.htm>. 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/>
- The MA 154 Course Web Page: <http://www.ipfw.edu/math/courses/ma154/>
- The *e-Grade* Software Web Page: <http://www.ipfw.edu/math/courses/egrade.html>
- 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.

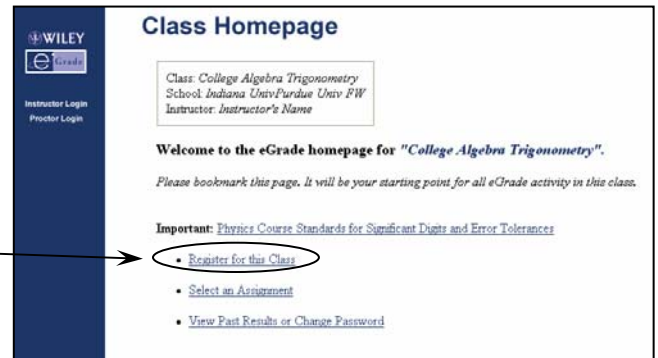
## 11. e-Grade

For additional practice on homework you can use the (free\*) *e-Grade* computer tutorial found at <http://www.ipfw.edu/math/courses/egrade.html>, which immediately grades your answers and provides worked-out solutions. This software is accessible from any Web access point.

\*The software is *free* to use for anonymous practice assignments: in this case no grades are entered in your instructor's gradebook or saved to your user profile. **If your instructor requires e-Grade as part of your grade, however, you must acquire or purchase (in the bookstore) a 17-digit registration code.**

## Use the following instructions if you are using e-Grade for graded homework:

1. Go to <http://www.ipfw.edu/math/courses/egrade.html> to find the link to your home page for your instructor's section.
2. Click on the link for your instructor. You will see a page similar to the page at the right. This is the starting point for everything involving the class. From here you can start assignments and tutorials or view the results of past work.



3. The first time you are here, click on **Register for the Class**.
4. Enter the 17-digit number (like 0305-6981-5888-0123-9) which you should find in a sticker attached to your Student Learning Guide.

5. Once you accept the license agreement, you must register with the system. You should **not** enter your social security number for the Student ID Number; this might be displayed at the top of graded assignments which could be seen by others if you view this in a computer lab. Instead, enter something bogus like 999999999. You should, however, type a valid e-mail address, so if you ever forget your password the system can send you a new one.

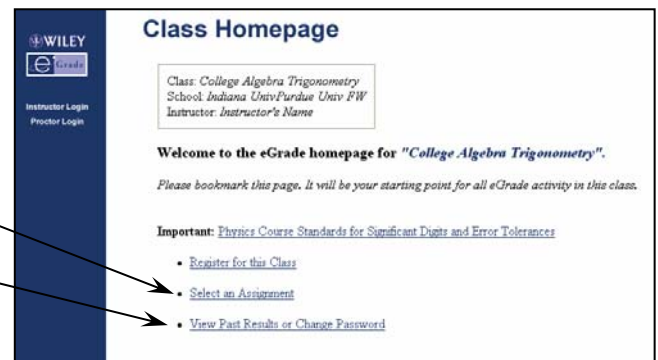
6. Once you are registered, your options include **Select an Assignment** (for graded assignments or anonymous practice)

or

**View Past Results or Change Password**

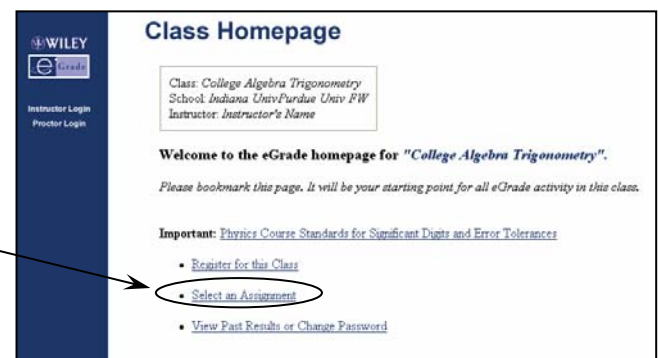
For these you will need to enter your User ID and password. Be sure to keep this access information private from your fellow classmates.

Logging in under someone else's account is considered fraudulent behavior, and will be reported to the Dean of Students.




## If e-Grade is NOT required, but optional:

1. Go to <http://www.ipfw.edu/math/courses/egrade.html> to find and click on the link to the general class home page.
2. Click on the middle link **Select an Assignment** for anonymous practice. (You won't use the other links **Register for the Class** or **View Past Results....**)



Whether you use e-Grade for graded assignments or your own practice, you can find additional help at <http://egrade.wiley.com/pilot2/students/help/>, some of which is repeated below.

Once you select an assignment from the list, you may see a popup box which says “**You have selected an assignment that requires the Math Package.**” You cannot download the Math Package on a computer in the IPFW lab, since it is refreshed each time it is rebooted. You don’t need it anyway. The system default mode is Text Mode, which operates using syntax similar to a graphing calculator, combined with a Preview option, which allows you to see what your expression looks like when presented as typeset mathematics.

For help at any time within e-Grade, click on the  button.  
[Help]

### Avoiding Common Math Errors

1. **Exponents:** Use the caret, ^, for exponentiation.
2. **Parentheses:** Like on a graphing calculator, you must use parentheses. When in doubt, you can use the Preview option to see it look the way it would in a math text.

Examples:

For  $2^{x/13}$ , you must type `2^(x/13)`

not `2^x/13` . . . which would be interpreted as  $\frac{2^x}{13}$

For  $y = \frac{x}{4(x-2)}$ , you must type `y = x / (4 (x-2) )`

not `y = x/4 (x-2)` . . . which would be interpreted as  $\frac{x}{4}(x-2)$

and not `y = x/[4 (x-2) ]` . . . which would be give you a syntax error.

**Note:** If an expression requires *nested* parentheses as in the previous example, do NOT use { } or [ ] as in math texts; instead you should use ( ).

Another example:

A complicated expression like  $\sqrt{1 + \frac{x}{5(x+3)}}$  would need to be entered as `sqrt(1+x/(5(x+3)))`

If you type `sqrt(1+x/[5(x+3)])` you would get an error.

3. **Watch your Case:** You can use any letter for a variable name, but you should always use the same letter that is used in the question. If the question asks you for `(t+1)^2` then the answer `(x+1)^2` will be graded wrong. Also, the system is case sensitive. So, if instead of typing `(t+1)^2` you enter `(T+1)^2`, your answer will be graded wrong.
4. **Multiplication:** You can type an asterisk (i.e. \*) for multiplication, or just type a letter and a number together (i.e. 2x).
5. **Square Roots:** The square root function is `sqrt(x)` or you can just type `x^(1/2)` or `x^0.5` instead. Note again that, like on a graphing calculator, `x^1/2` means  $\frac{x}{2}$ .
6. **Absolute Value:** The absolute value function is `abs(x)`, so something like  $2|x+1|-3$  would be typed as `2abs(x+1)-3`. You would **not** type `2|x+1|-3`.

7. **Argument of Functions:** You should always place the argument of a function in parentheses.

For example, for  $\sqrt{3x}$  you must type `sqrt(3x)`,

not `sqrt 3x` . . . which would be interpreted as  $\sqrt{3} \cdot x$

*Note:* The lower level TI calculators (85, 82, and 81) will allow you to enter `sqrt 3x` and `log x/2` without parentheses. Both **e-Grade** and the higher level TI calculators use the standard convention and require you to put the argument of the function in parentheses in order for your answer to be correctly interpreted.

**For MA 154 or MA 159 students:**

8.  **$\pi$ :** Simply type `Pi` or `pi`. (However, not `PI`.) Do **NOT** use 3.14.

9. **Trigonometric Functions:** The names for common trigonometric functions (sin, cos, tan, etc.) are just what you would expect; but in all lower case and with appropriate use of parentheses. For example, you want `sin(x)` and **NOT** `sinx` or `Sin(x)`, neither of which the system would recognize. The inverse trig functions are `arcsin(x)`, `arccos(x)`, and `arctan(x)`. Also, trigonometric functions are all set to work in radians.

10. **Use calculator syntax:** As stated before, when you enter formulas, type this as you would enter them on most graphing calculators. In particular,


- $\cos^2 x$  is `cos(x)^2`. It is **not** `cos^2(x)`
- **Parenthesize carefully!**  $\sin 2x$  is `sin(2x)` ,  
not `sin 2x` . . . which would be interpreted as  $\sin 2 \cdot x$ .

If you are interrupted during a homework assignment or quiz, you can log back into the system and return to the assignment where you left off. Your interaction with the system is saved as you move from one question to the next.

To grade your completed assignment click on the  button.


[Grade]

If you have not answered any of questions in your assignment, you will be warned and have the opportunity to complete them before grading. If any of your answers include math syntax errors or other input not understood by **e-Grade**, you will also be warned and have the opportunity to fix those specific questions.

When ready, you would just press the  button again. You will then see your percentage grade and the number of questions correct.

[Grade]

(If signed in, your score is then automatically entered in your instructor's gradebook.)

To view your graded assignment and see any detailed feedback that is available, click on the  button.

Finally, click on **[PRINT]** to get a hardcopy. (Don't use the Print button on your browser.)

[Details]

## 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?

See the next page...

**Suggestion 1:** Read the book. Really, really read it. Sit down and read it. Carefully. Again and again. It's truly an excellent book.

**Suggestion 2:** Do lots of individual homework. Do every problem assigned by your instructor on time, and then do a few more for good measure. Remember, there's no substitute for daily preparation. Understanding material in later chapters typically requires that you understand concepts in previous ones.

**Suggestion 3:** Recopy your notes.

**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!

**Suggestion 5:** Get help as soon as any problems arise. Which takes you to the second column of resources....

**Resource 1.** Talk to your instructor. Use the office hours.

**Resource 2.** Use the common office hours (schedule forthcoming) of other instructors who teach the same course.

**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.

**Resource 4.** Use the Center for Academic Support and Advancement (CASA) for tutoring or use drop-in tutoring in Kettler G21.

**Resource 5:** Use the Web, starting first with the Internet resources listed in this handout.