1. **Why Do I Need College Algebra and Trigonometry?**

Many students take this course because it is required for their degree. But there are better reasons than that!

In this course you will
- create and interpret mathematical models to solve problems presented as real world situations.
- formulate, validate, and analyze solutions to problems using mental, paper and pencil, algebraic, and technology-based techniques as appropriate.
- utilize graphing calculators to find the solution to problems which cannot be solved by pencil and paper, as well as explore mathematical patterns and visualize mathematical ideas.
- build a foundation for quantitative literacy to help you solve problems in and outside of academia.
- learn to make sense of the mathematics you will need, not only for future course work in math and the physical and social sciences, but in any career which requires you to analyze information.

The above aligns with the goals of the IPFW Baccalaureate Framework (See Section 3) and is based on the guidelines of the Mathematical Association of America’s subcommittee, Curriculum Renewal Across the First Two Years (CRAFTY). For the full document, see [www.maa.org/cupm/crafty/](http://www.maa.org/cupm/crafty/).

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. **The IPFW Baccalaureate Framework**

The IPFW faculty have identified six foundations of baccalaureate education. These foundations provide the framework for all baccalaureate degree programs.

*Acquisition of Knowledge* Students will demonstrate breadth of knowledge across disciplines and depth of knowledge in their chosen discipline. In order to do so, students must demonstrate the requisite information-seeking skills and technological competencies.

*Application of Knowledge* Students will demonstrate the ability to integrate and apply that knowledge, and, in so doing, demonstrate the skills necessary for life-long learning.

*Personal & Professional Values* Students will demonstrate the highest levels of personal integrity and professional ethics.

*A Sense of Community* Students will demonstrate the knowledge and skills necessary to be productive and responsible citizens and leaders in local, regional, national, and international communities. In so doing, students will demonstrate a commitment to free and open inquiry and mutual respect across multiple cultures and perspectives.

*Critical Thinking and Problem Solving* Students will demonstrate facility and adaptability in their approach to problem solving. In so doing, students will demonstrate critical-thinking abilities and familiarity with quantitative and qualitative reasoning.

*Communication* Students will demonstrate the written, oral, and multimedia skills necessary to communicate effectively in diverse settings.

The foundations are interdependent, with each one contributing to the integrative and holistic education offered at IPFW.
4. **Prerequisite Skills**

MA 15300, MA 15400, and MA 15900 are intended for students who have completed two years of high school algebra. The prerequisite for MA 15300 or MA 15900 is completion of Intermediate Algebra MA 11300 with a C or higher or placement by departmental exam. The prerequisite for MA 15400 is MA 15300 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 11300, or its prerequisite, Elementary Intermediate Algebra MA 10900.

<table>
<thead>
<tr>
<th>Use algebraic symbols and notation.</th>
<th>Section 1.1 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand function notation, and find the domain and range of a function if given its graph.</td>
<td>Ch 1 Review  35</td>
</tr>
<tr>
<td>Perform the following activities with lines:</td>
<td>Section 1.5: 2, 17</td>
</tr>
<tr>
<td>a. Graph equations in standard form and slope-intercept form.</td>
<td>Ch 1 Review: 19-25 odd</td>
</tr>
<tr>
<td>b. Compute the slope given two points.</td>
<td>Tools for Ch 1: 1-25 odd</td>
</tr>
<tr>
<td>c. State the slope and vertical-intercept given a linear equation.</td>
<td></td>
</tr>
<tr>
<td>d. Work with lines which are parallel or perpendicular.</td>
<td></td>
</tr>
<tr>
<td>e. Write the equation of a line given its slope and another point.</td>
<td></td>
</tr>
<tr>
<td>f. Write the equation of a line given if given two points.</td>
<td></td>
</tr>
<tr>
<td>g. Write the equation of a vertical or horizontal line.</td>
<td></td>
</tr>
<tr>
<td>Solve a system of two linear equations in two variables (having no, one, or many solutions) by graphing, substitution, or elimination.</td>
<td>Tools for Ch 1: 33-43 odd</td>
</tr>
<tr>
<td>Apply properties of positive integer exponents.</td>
<td>Tools for Ch 3: 1-23 odd, 95-111 odd</td>
</tr>
<tr>
<td>Apply properties of negative integer or rational exponents.</td>
<td>Tools for Ch 3: 25-43 odd, 78-86 odd</td>
</tr>
<tr>
<td>Perform multiplication and division with radicals.</td>
<td>Tools for Ch 3: 45-55 odd, 61-75 odd</td>
</tr>
<tr>
<td>Change the form of an algebraic expression in factored form by expanding ; reverse the process by factoring.</td>
<td>Tools for Ch 2: Expand: 1-25 odd</td>
</tr>
<tr>
<td>Factor: 29-65 odd</td>
<td></td>
</tr>
<tr>
<td>Use algebra to solve the following equations:</td>
<td>Tools for Ch 2: By Factoring: 77-95 odd</td>
</tr>
<tr>
<td>a. Quadratic with real solutions.</td>
<td>By Raising Both Sides to a Power: 83, 105</td>
</tr>
<tr>
<td>b. Fractional leading to a linear or quadratic.</td>
<td>Fractional Equations: 81, 87-91 odd, 101</td>
</tr>
<tr>
<td>d. Radical leading to linear or quadratic.</td>
<td>Tools for Ch 5: Using the Quadratic Formula: 37-41 odd</td>
</tr>
<tr>
<td>Complete the square for a quadratic expression.</td>
<td>Use the Best Strategy: 43-55 odd</td>
</tr>
<tr>
<td>Simplify algebraic fractional expressions</td>
<td>Tools for Ch 5: 1, 4, 13-17 odd, 19, 23, 27</td>
</tr>
<tr>
<td>Solve problems involving basic geometric concepts including the Pythagorean Theorem, formulas for area and perimeter of rectangles, squares, triangles, and circles, and volumes of rectangular prisms and cylinders.</td>
<td>Tools for Ch 9: 1-13 odd, 62-66</td>
</tr>
</tbody>
</table>

| Section 1.3: 16, 17  |
| Ch 1 Review: 36  |
| Ch 2 Review: 42a  |

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

MA 15900 (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 15900 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.

The sequence MA 15300 - MA 15400 (3 credits each) is a two semester version of MA 15900. 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 15900 will accept credit in successful completion of both MA 15300-MA 15400.

6. A Team Approach to Problem Solving

A primary goal in this course is the ability to work as a functioning member of a team to solve challenging problems and analyze mathematical information. Working in a group not only helps you develop the interpersonal skills required for the workplace, but will help you meet many other course goals as well:

- communicating your reasoning orally,
- actively listening and understanding the reasoning of other team members, and
- creating logical arguments. If you can’t explain it, it is likely you don’t fully understand it.

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, share 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.” The manager keeps everyone on task, e.g. “What you had for lunch isn’t relevant.”. He or she takes one of the other roles if one of the group members is absent.

Reader – reads the problem aloud to the group. Afterwards, takes on other roles, such as Quality Controller.

Scribe – writes up the group's solution to the problem for presentation to the class, showing the necessary steps to the solution and, if appropriate, writing verbal interpretations of the mathematical concepts in complete sentences.

Quality Controller – double-checks for correctness, capitalizing on the Rule of Four where appropriate.

Clarifier – ensures all participants understand the ideas expressed by other group members, paraphrasing the ideas presented by others and questions everything.

7. Reading Assignments

Students often notice that the text for this course looks different than math textbooks they have used in the past. You might notice the following strengths of this text as opposed to traditional, older math texts:

- **Real world connections**
  - Many concepts are introduced and investigated through simple, realistic applications which are also used by partner disciplines (economics, physical and social sciences, etc.)

- **Multiple perspectives**
  - There is equal emphasis between analytical (symbolic), graphical, numerical, and contextual approaches.

- **Conceptual Understanding**
• Doing the exercises requires an understanding of the material in the text, not searching for a similar worked out exercise in the text and changing the numbers in a “pattern example”.
• Supplemented with e-Homework (Section 12), which provides virtually unlimited number of worked out examples, students have opportunities to integrate and apply their knowledge in new situations.
• Problem solving and cooperative learning
  • Open-ended problems in the text are not cut and dried, providing an opportunity for exploratory learning, use of technology, and small group discussion. Many problems have multiple solution paths.
  • Problems require critical thinking, where you must choose an appropriate mathematical model given a real world situation and interpret what mathematical formulas mean. There is much less emphasis on lower ordered thinking skills such as “plug and chug” or rote memorization.

Compare the above with the Course Goals (Section 2) and the IPFW Baccalaureate Framework (Section 3).

If you have used a traditional math text in the past, it may have been possible to do relatively well in the course without reading the text before coming to class. In an interactive class setting such as this one, where students work on the material and grapple with the problems together, it is absolutely essential that you do the reading assignments prior to class. In fact, the book is written in an informal way to help you make sense of the concepts. Since this may be a new approach, here are some tips to help you read the book before class:

1. Plan some time to do the reading more than once. On the first reading, it is unlikely that you will have a perfect understanding of everything.
2. After you have read it once, try to summarize in your own words the big ideas. Then re-read the section.
3. On the second time through, bring out your graphing calculator, paper, and pencil to work out the examples along with the authors to get a thorough understanding of everything in the section.
4. If something does not make sense, make a note of it to bring it to your instructor, fellow group members, or a tutor at the Tutoring Center (CASA, Kettler G21). Sometimes if you return to it when your mind is fresh, the fog lifts all on its own.

8. Keys to Success

Your behavior is a key ingredient to your learning.

• 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. Travel plans, social functions on campus, appointments with an advisor, non-emergency appointments with your dentist, etc., are never an excuse to miss class.
• Be in your seat and ready to begin at the start of class and do not leave until the class is finished.
• Sit with your assigned group members.
• Come prepared to be engaged in learning mathematics. The classroom is not a place to read the newspaper, work on homework from other courses, send/receive text messages, or surf the Internet. Once you arrive to class, bring out your graphing calculator. Silence and put away any other electronic devices.
• Listen actively. When your instructor or your fellow students are talking to the class, be respectful, polite, and silent so that people around you can hear. Do not continue working in your group.
• To benefit from an interactive class, come to class prepared, having done the assigned reading and attempted the homework problems so you can contribute to your team. Ask questions if you have trouble as soon as you have difficulty. Use your instructor’s office hours or the department’s common office hour program.
• Show your work if the solution requires it, as opposed to just writing down an answer. Problem solving is a central focus of this course. Documenting the journey is at least as important as reporting the final destination.

9. Study Time Outside of Class

This course requires a solid effort. During the Fall or Spring Semester, the faculty at IPFW expect you to study a minimum of 6 hours a week outside of class working on mathematics for MA 15300 or MA 15400 and 10 ten hours per week for MA 15900.
10. 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 (ipfw.edu/math/) maintains an Assistance with Graphing Calculators Website 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-83/84 or TI-83/84 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. 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 a nominal fee from the Indiana University Purdue University Fort Wayne Students’ Government Association (IPGSA), located in the Walb Student Union Room 225 (260-481-6586). 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.

11. Internet Resources and your IPFW Computer Lab Account

If your instructor has their own Home Page or uses Blackboard at http://elearning.ipfw.edu/, be sure to go there first. In addition, you can access Course Websites as follows:

- Go to the Department of Mathematical Sciences Web Page ipfw.edu/math/, click on Course Information and then on Math Course Materials on the left side of the page. Then scroll to find the appropriate course.

Student-access computer labs are located around campus. For a complete list, go to the Information Technology Services Website at http://ipfw.edu/its/, click on Resources & Services and then Facilities. You will should see a link for Student open access computer labs. To use the computers in these labs you must have an activated IPFW computer Lab Account, which you received when you enrolled in IPFW. If you no longer have your activation packet, go immediately to the Help Desk at Kettler 206 with a picture ID to obtain a new packet.

12. eHW at ipfw.edu/math/

The department has purchased a site license for a Web-based electronic homework (eHW) system, which immediately grades your answers and provides worked-out solutions. This gives you many advantages:

- Online homework has been shown to help students develop mastery of those algebraic techniques that are needed for problem solving and mathematical modeling, as well as for later mathematics course work.

- Students sometimes share that they want to learn by watching the teacher do one example after another. This is not the best use of class time. In class, you work in teams to solve problems, communicate your reasoning, and see how mathematics can apply to your lives. Outside of class, online homework can enable you to see patterns through repeated practice, get immediate computer-graded feedback, and keep re-doing the assignment until you get it correct.

- Students have generally responded favorably to online homework when it was piloted previously.

Unsolicited student comments include the following:

- “I flunked this class last semester. This semester, the night before each test, I do online homework over and over just for practice and now I’ve been getting B’s on exams.”
- “Handing in regular (paper and pencil) homework is a one shot deal – you miss it and there’s no redo. But I can redo eHW until I get a 100%. Without eHW, I would have failed the class.” online assignment.”
Students who have responded unfavorably generally did not like any kind of math homework, expressed frustration because they did not round numbers correctly, or were not able to enter mathematics in a computer using parentheses. The latter skill is also important when using a graphing calculator and even required for some questions on paper and pencil exams, e.g., $2^{(x+4)}$ is not the same as $2^{x+4}$.

- When re-doing an assignment to improve your score, you must re-do all of the questions in that assignment, not just the ones you missed. Sometimes the questions do not look exactly like the ones in the previous assignment, but test the same concept. This is an intentional design and not a flaw. Research has shown that if students do an assignment only once, even perfectly, they do not retain the concepts later. It is important to use eHW as a tool for learning, not just for putting a grade in a gradebook.

- You do not need to install any special software to use eHW and do not need a home computer. You only need access to a computer with an Internet connection such as those in the open-access labs on campus or, if off-campus, you could use computers in the public library. Some students have used the computers right in The Spot (the IPFW tutoring center in Kettler G21) to work on their eHW.

- Once you complete an assignment, your score is immediately recorded in the instructor’s Gradebook. You need not print anything to submit to your instructor. At any time, you can view your results from past assignments and the worked out solutions by clicking on the Gradebook link.

- You do not need to complete an assignment all in one sitting; however, you can only work on one assignment at a time. 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. If thunder strikes your computer during the assignment and you lose your connection prior to submitting it, everything up until the last question you were on will be saved.

**Getting to the eHW Site**
Here is a visual path to get to the eHW site.

1. Go to [ipfw.edu/math/](http://ipfw.edu/math/) and click on e-Homework.

2. On the e-Homework Page, you can purchase an access code if you do not already have one. It is good for an entire year.
The link takes you to the Maplesoft Web Store. If this is your first time you have been there, you will need to take a moment to create a membership account with Maplesoft with a userid and a password (which is not your eHW access code). It is vitally important that you enter your information correctly.
For example, if George Washington were a student at IPFW, his e-mail might likely be

\[
\text{washg01@students.ipfw.edu} \quad \text{👍}
\]

It would not be:

\[
\text{washg01@ipfw.edu} \quad \text{👎}
\]

A common problem: students have often provided Maplesoft with an incorrect e-mail address. The company then sends the access code to the bogus address, it bounces, and the student never receives what they paid for. Customer Service phone lines then become jammed with students who are irate over a problem they could have avoided. Please be careful when entering your e-mail address.

An access code must be purchased online with a credit card (and not a debit card.)
If you do not have a credit card, purchase a pre-loaded credit card, available at a local supermarket.

Contact Maplesoft customer service at 1-800-267-6583 ext. 240 or by e-mail at custservice@maplesoft.com if you need help purchasing an eHW access code.

3. On the e-Homework Page, you can login to the eHW system from any computer connected to the Internet. From there you will be directed to the Login page.

4. On the e-Homework Page, you can get help if you have technical difficulties.

Note: When you have trouble, please e-mail ehwtechsupport@ipfw.edu describing the problem in as much detail as possible.
**How to register in your class in five steps:**

1. Purchase an eHW Access code (See previous page). On the login screen, enter the login and password you received once you purchased the code. It will not be the same as your IPFW user account.

2. Once logged in, you will be immediately asked to verify your information shown in each box below.

   **Important!**
   You need to change the four starred boxes or your instructor will not know who you are!

   **Example:**

   - **First Name**: George
   - **Last Name**: Washington
   - **Display Name**: 
   - **Student ID**: washg01@students.ipfw.edu
   - **Email**: washg01@students.ipfw.edu

   If you forget your password, the system will e-mail it to the address you enter here. If this address is incorrect, you will not receive it.

   After you have typed the above, click Submit. Once your changes have been accepted, you will be sent to the System Homepage.

3. Click on **Find classes open for registration**. You will then see a list of sections, such as:

   **Classes with open registration**

<table>
<thead>
<tr>
<th>Class Name</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 153 Practice Questions</td>
<td>Horé Désargues</td>
</tr>
<tr>
<td>MA 153-01 MWF 9:00-9:50</td>
<td>David Hilbert</td>
</tr>
<tr>
<td>MA 154 Practice Questions</td>
<td>Pythagoras of Samos</td>
</tr>
<tr>
<td>MA 159 Practice Questions</td>
<td>Hipparchus of Nicea</td>
</tr>
<tr>
<td>MA 159-01 MTWR 4:30-5:45pm KT 643</td>
<td>Maria Agnesi</td>
</tr>
</tbody>
</table>

   Check the box for the correct section(s). Be sure to scroll all the way to the bottom to click **Register**.
4. You will then be asked to confirm the class(es) in which you are registering. For example:

You are enrolling as a student on the following classes:

- MA-153 Practice Questions**************
- MA-153-01 MWF 9:00-9:50

Click **Confirm** to complete the self-registration.

5. That’s it! You won’t need to do this process again this semester.  
   Click on the link for your section to get to your Class Homepage:

   **A sample eHW session:**
   From this link, you will be able to take assignments, view past results in the **Gradebook** in the top left corner, or change your password by clicking the **My Profile** link in the top right corner.

1. Once you are registered in your instructor’s course (see previous page), login again to access eHW.

   On the login screen, enter your login 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.

2. Once logged in, click on the link to the course homepage.

3. Once there, you will see a list of any assignments.  
   Click on the link to your assignment.

4. The total number of questions in a particular assignment appears in the upper right corner of your screen.
   The **Assignment Navigation Bar** appears at the top of every page within an assignment. To move between questions use the **Back** and **Next** buttons within the **Assignment Navigation Bar**.

   You can also jump to specific questions you may have skipped by using the **Question Menu** and selecting a specific question number in the drop-down menu.
To grade your completed assignment, click on the Grade link.
To log out of your current assignment to return to complete later, click the Quit & Save link.

**Important:** The only way it will be submitted to your instructor is if you click on Grade. You can see your graded assignment later by clicking on the Gradebook link. Be careful that you don’t just click on Quit and miss an assignment deadline. If you can see it in your Gradebook link, your instructor can see it as well.

**Grading Your Assignment and Viewing Worked Out Solutions:**
Once you click on the Grade link, 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 eHW, you will also be warned and have the opportunity to fix those specific questions:

<table>
<thead>
<tr>
<th>Back</th>
<th>Next</th>
<th>Grade</th>
<th>Help</th>
<th>Quit &amp; Save</th>
</tr>
</thead>
</table>

**Warning:** There appear to be errors in your answers to the questions listed below.
- If you press Grade button or click on one of the questions in the list to go back and correct your work.
- If you press Grade again, you will get your grade immediately, but the questions listed below will all be graded as wrong.

**Question 1:** (1 point) The question has not been answered
**Question 2:** (1 point) Has not been answered yet.
**Question 6:** (1 point) The formula has no symbols in it.
**Question 7:** (1 point) You have not filled in all the blanks.

Once you click on Grade, you will see your percentage score and the number of questions you answered correctly.

To view your graded assignment and see any detailed feedback that is available, click on the View Details link. You will then see your actual assignment with solutions and any detailed feedback, with an option to print.

**Working with Math in Responses**
You enter formulas using standard mathematical notation similar to that used in a graphing calculator, following the rules for standard order of operations. Some helpful tips follow for entering responses. The most common mistake is parentheses (#2 on the list below) and variable names (#3 below).

**Avoiding Common Math Errors**

1. **Exponents:** Use the caret, ^, for exponentiation, and the letter \( e \) for 2.718...
2. **Parentheses:** As 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 \( \frac{x}{4}(x-2) \)

3. **Variable Names:** 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 \( \frac{1}{2} \).

6. **Absolute Value:** The absolute value function is \( \text{abs}(x) \), so something like \( 2|x+1|-3 \) would be typed as \( 2\text{abs}(x+1)-3 \).

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 eHW 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 159 or MA 154 students especially:

8. **\( \pi \):** Simply type \( \text{Pi} \) or \( \pi \). (However, not \( \text{PI} \).)

9. **Trigonometric Functions:** The names for common mathematical functions (sin, cos, etc.) are just what you would expect. The inverse trig functions are \( \text{arcsin}(x) \), \( \text{arccos}(x) \), and \( \text{arctan}(x) \). Also, trigonometric functions are all set to work in radians.

**Using the Preview Option in Responses**

Use the **Preview** option to view your response as a typeset mathematics expression. **Preview** demonstrates how the system interprets your entry (inspecting it for misplaced parentheses and other unintended keystrokes).

For example, in the following question, suppose a student types \( \frac{5}{9x+7} \) in the box. (Note that this is incorrect.)

Suppose a student wishes to enter the expression below into a graphing calculator or a computer:

\[
\frac{5}{9x + 7}
\]

Show that you can enter it correctly by typing the expression in the box below.

**TIP:** Type your answer in the box and click on the **Preview** icon to check you typed your answer correctly.

\[
\frac{5}{9x + 7} = \frac{5}{9x+7}
\]

The entry boxes with a small icon beside them are designed to accept numbers or formulas.

Help | Change Math Entry Mode

After typing \( \frac{5}{9x+7} \) in the box and clicking on **Preview**, a pop-up appears showing how it would appear in “pretty print.”
Remember, knowing order of operations is part of the mathematical content of the course, not something extra to satisfy a picky piece of software. Order of precedence is as follows:

**Parentheses**

**Exponents**

**Multiplication and Division** (from left to right)

**Addition and Subtraction** (from left to right)

Some students use the mnemonic:

Please

Excuse

My Dear

Aunt Sally

For example, if you were to compute \( 8 \div 4 \times 2 + 3 \), multiplication and division outrank addition, but multiplication and division are the same rank.

\[
8 \div 4 \times 2 + 3 = \frac{8}{4} \times 2 + 3 = 4 + 3 = 7
\]

Notice this is what you would obtain from a graphing calculator:

\[
\frac{8}{4/2+3}
\]

Rules for order of operations are necessary so that a unique value results. Consider the following:

\[
8 \div 4 \times 2 + 3 \neq \frac{8}{4 \times 2} + 3 = 1 + 3 = 4
\]

\[
8 \div 4 \times 2 + 3 \neq \frac{8}{4 \times 2 + 3} = \frac{8}{11}
\]

\[
8 \div 4 \times 2 + 3 \neq \frac{8}{4} \times (2 + 3) = 2 \times 5 = 10
\]

Parentheses outrank all operations. If your intention is to have \( \frac{8}{4 \times 2} + 3 \), the fraction bar serves as a grouping symbol.

The expression \( \frac{8}{4 \times 2} + 3 \) is equivalent to \( \frac{8}{(4 \times 2)} + 3 \).

So if our intention is \( \frac{8}{4 \times 2} + 3 \), we need parentheses: \( 8 \div (4 \times 2) + 3 \).

Returning to the example, when you type \( \frac{5}{(9x+7)} \) and click on the Preview icon, a pop-up will confirm that you have correctly typed the desired expression.
**Nested Parentheses**

To computers and graphing calculators, brackets such as [ or ] or braces such as { or } are not equivalent to parentheses.

For example, to enter $3^{2(x+1)}$ you would type $3^{(2 \div (x+1))}$ as opposed to $3^{(2/ [x+1])}$.

**Using the Symbol Palette in Responses**

A symbol palette is also available if you click on Change Entry Style (囗) or Change Math Entry Mode.

Suppose a student wishes to enter the expression below into a graphing calculator or a computer:

$$\frac{5}{9x + 7}$$

Show that you can enter it correctly by typing the expression in the box below.

TIP: Type your answer in the box and click on the Preview (囗) icon to check you typed your answer correctly.

The entry box with a small icon beside them are designed to accept numbers or formulas.

After you click 囗 or click Change Math Entry Mode you will see a pop-up box explaining the advantages of Text Mode (default) and Symbol Mode.

**Important:** If you want to work with the current question using the alternate math entry mode, you may need to reload the question after selecting the math entry mode. Return to your question, and use Next and Back buttons to scroll forward and then back to your question. This forces the system to reload the question using your preferred style of entry.
If you select **Symbol Mode**, you stay in this mode indefinitely unless you change it back to **Text Mode**.

For symbol mode, after downloading a tool, you will see the Equation Editor appear (assuming you have Java installed on your computer.)

Right-click (or **Control**-click on Macintosh) in the box.

The main palette is displayed.

Click a palette to display all symbols in the palette group. Select a symbol/expression. It is displayed in the Equation Editor field.

Modify as necessary.

Click **Next** to move to the next question in your assignment.

The system allows you to toggle Math Entry Modes as often as you want, depending on the requirements of the question and your personal preferences. Each time you change the style of math entry, the system remembers your responses on previous questions, and automatically translates them for you. If you move to a previous question (where you have already entered an answer), your response is displayed in the current editor mode.
You can use the following shortcut keys when entering answers in the Equation Editor in Symbol Mode. For example, **Ctrl** followed by **Space** completes a symbol.
(If more than one completion option is presented, select the desired symbol.)

<table>
<thead>
<tr>
<th>Shortcut Characters</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ctrl + Space</td>
<td>symbol completion</td>
</tr>
<tr>
<td>^ (caret)</td>
<td>superscript</td>
</tr>
<tr>
<td>_ (underscore key)</td>
<td>subscript</td>
</tr>
<tr>
<td>/</td>
<td>fraction</td>
</tr>
<tr>
<td>Ctrl + '</td>
<td>underscript</td>
</tr>
<tr>
<td>Ctrl + Shift + &quot;</td>
<td>overscript</td>
</tr>
<tr>
<td>Ctrl + _</td>
<td>pre-subscript</td>
</tr>
<tr>
<td>Ctrl + [</td>
<td>scope out</td>
</tr>
<tr>
<td>Ctrl + ]</td>
<td>scope in</td>
</tr>
<tr>
<td>Ctrl + /</td>
<td>return cursor to baseline</td>
</tr>
<tr>
<td>Ctrl + Shift + G</td>
<td>Greek mode (next character entered as Greek)</td>
</tr>
<tr>
<td>Right-click (Control-click for Macintosh)</td>
<td>display palettes</td>
</tr>
</tbody>
</table>

**Rules for Rounding**

Standard rules for rounding numbers apply.
For example, suppose we are rounding the following calculations to two decimal places.

```
\[
\begin{array}{l}
1.12^2 \quad 1.2544 \\
1.12^8 \quad 2.475963176 \\
1.12^{41} \quad 104.2170869 \\
\end{array}
\]
```

Look to the right of the rounding digit, which we have underlined.

- If it is 4 or lower, we truncate. So to two decimal places, \(1.12^2 \approx 1.25\)
- If it is 5 or higher, we round up. So to two decimal places, \(1.12^8 \approx 2.48\)

and to two decimal places, \(1.12^{41} \approx 104.22\)

What is \(1.12^{23}\) to two decimal places? Since the digit to the right of the rounding digit is 2, we have \(1.12^{23} \approx 13.55\).

Your calculator mode can be helpful to report answers to a selected number of digits.

```
\[
\begin{array}{l}
1.12^2 \quad 1.25 \\
1.12^8 \quad 2.48 \\
1.12^{41} \quad 104.22 \\
1.12^{23} \quad 13.55 \\
\end{array}
\]
```

However, use caution when doing so! It is easy to forget to change it back to FLOAT and report incorrect results when you need more precision.

If you want \(1/8\) reported to full precision and your mode is not set to FLOAT, you could be misled by your calculator!
13. **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?

| **Suggestion 1**: Read the book. Really, really read it. Sit down and read it. Carefully. Again and again. It's truly an excellent book. |
| **Resource 1**: Talk to your instructor. Use the office hours. |
| **Suggestion 2**: Do lots of individual homework. Understanding material in later chapters typically requires that you understand concepts in previous ones. |
| **Resource 2**: Use the common office hours (schedule forthcoming) of other instructors who teach the same course. |
| **Suggestion 3**: Recopy your notes. |
| **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. |
| **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! |
| **Resource 4**: Use the Center for Academic Support and Advancement (CASA) for tutoring or use drop-in tutoring in Kettler G21. |
| **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…. |
| **Resource 5**: Use the Web, starting first with the Internet resources listed in this handout. |