

LEARNING MATHEMATICS

Welcome to the wonderful world of Mathematics! In order to help you get the most out of Math, please read and consider the following.

SOME INITIAL POINTERS:

Math is likely to require that you make a substantial investment of **TIME**. Probably a minimum of two hours outside class for every hour you spend in class. Build this into your life. You should work on it some everyday, whether you have class or not and whether anything is due or not. One of the advantages of mathematics is that it can be done virtually anywhere, anytime. You can use time when you are in the shower or waiting in line to be thinking about problems or going over new concepts in class.

One of the best ways to learn anything is to explain it to someone else. Working in groups is a good way to provide yourself with this opportunity. You can also amaze your friends with careful explanations of, say, all of the different interpretations of the concept of a derivative.

Math is not a spectator sport. You will need to actively participate, roll up your sleeves and get that pencil moving. You will also need to move your brain. **Expect to have to think about concepts and problems.** Some of the problems you will encounter will teach you new techniques: like playing scales in a musical instrument, or running laps around a track. **You might not see the point immediately**, but they are strengthening you so everything will come together when it counts. Think of them as **push-ups for the brain** and practice them often. Some problems will require you to think hard and pull concepts together (at this point you will be glad you did your push-ups). Take some time with them, talk about them, take breaks if you are getting frustrated, ask for help if you are stuck, **enjoy the process: you are learning.**

If you are in Calculus, expect this to be different. There are likely to be better prepared students here than in your previous math classes, but remember that you are trying to learn Calculus and not competing with other students. Expect to have to do more work and for the course to move at a faster pace.

Many problems that require Mathematics cannot be solved with simple application of a “formula”. To paraphrase Albert Einstein, “The only thing you absolutely must know is the location of the library.” In your situation this means you will probably always be able to find the formula you need somewhere. However, you will need to be able to set up your problems so that you know exactly what it is that you need! Many of you will probably take more courses (depending upon your future plans) that utilize the concepts from this course. So, it will be especially important to understand what is useful or applicable in a particular context. This is why **understanding the process** for solving a particular type of problem is emphasized over memorizing formulas. **In most cases, if you understand the concepts, memorizing a formula becomes completely unnecessary because you construct the necessary tools when needed.**

NOW FOR SOME CONCRETE POINTERS:

A. Classes are held for your benefit. If attending class weren’t important, all courses would be by correspondence! During class your teacher will go over examples, which are important, and most likely not in the book. It often helps to have a new concept explained in several different ways; the book and the lecture are two different ways that are readily available. Information about quizzes, exams, and due dates is often given out in class. This will help you pace your studying. **Math courses are sequential**, so the stuff you see in Algebra 2, for example, will enable you to make sense of a lot of the stuff you will see in Pre-Calculus. As one teacher was heard to say, “Everything you have learned since you were three can be used in this class.” Hence **you will not be helping yourself if you “cram”** right before a test or quiz and forget the material immediately afterward. As teachers, we note a definite correlation between grades and class attendance. What's the point? **GO TO CLASS!!**

B. The plethora of information to be found in your textbook is astounding. One might even say it covers nearly everything you need to learn in Mathematics in one form or another. However, **math books are not meant to be read like novels** (even though they are often exciting and dramatic). It is generally best to read the sections of the book to be covered in class through quickly to get some idea of what is there before going to class. After the class read through it carefully, with pencil and paper in hand, working through examples in detail and taking notes. **Make a list of questions to ask at the next class.** One thing to bear in mind while reading your text is that **the result of an example is often secondary to the process used in**

obtaining the result. This is one reason you should be sure you understand all the details the author left out (most likely intentionally). Also, many techniques for solving problems are displayed elsewhere than in examples, so read **all** of the appropriate section. Even though it sometimes may not seem to be the case, **the text does give the tools to do the homework problems.**

C. Just as you must play a lot of basketball (or Tetris) to be good at it, you must **DO a lot of Math** in order to be successful. At minimum, **work every problem your teacher suggests.** If you are having trouble or want more practice, **work other problems** in that section or get another book and work problems out of it. Most texts also have “additional” or review problems at the end of each chapter. These may or may not be arranged by section. If you are having trouble getting a correct answer to a problem, **think about what is going wrong**, that way you can learn something new and prevent yourself from making the same error in the future. **Don't settle for a correct answer that you don't understand.**

Work problems more than once: a good way to start off a study session is to start by working some problems from the last few assignments. Work problems until you can do them quickly and they become your friends. You can even name the most difficult ones. When reviewing or re-doing a problem, **think about why you take the steps you do**, rather than simply repeating the problem in a robot-like fashion. Remember, **the process is usually more important than the result.**

The fastest way to get into trouble in Math is to not do the homework. Remember, similar problems will probably show up on quizzes and exams, where you will be expected to work them quickly and accurately, probably without the book in front of you. Also remember that you will get more out of your homework time if you **minimize distractions**, i.e., turn the TV or stereo off.

D. Contrary to many students' opinions, **your teacher wants you to succeed.** Extremely rare is the teacher who will intentionally put completely different material on an exam than what was covered in class. For this reason, **pay attention to your teacher and take notes.** Then **read your notes** and be sure you understand them, filling in any missing details. Use your notes as well as the text when doing homework. **Review your notes regularly** and pay attention to the

comments your teacher writes on your work. Read carefully all supplemental material provided by your teacher. Remember that if your teacher thinks an example is important enough to do in class, or takes the time to prepare a handout, it may also be of sufficient importance to test you on it.

E. Quizzes and tests can be the bane of your existence, or they can be **showcases of your mastery** of the material. When studying for them, **work every homework problem** assigned in the sections to be covered (more than once!), paying special attention to why you take the steps you do, and why it works. Review and work through examples in your notes and the text, again with particular emphasis on the process being used. Each section of your text has a central idea or concept. In many cases, this central idea depends in some way on an elementary concept with which you are already familiar. For example, finding volumes of some solids is simply an extension of finding areas of some geometric shapes that you already know. If you are able to explain exactly what the “nugget” of a section is and on what basic “stuff” it depends, chances are you are well on your way to a good understanding of the material at hand.

GETTING HELP:

Working in groups can be of enormous help in understanding Math concepts. One of the best ways to gain understanding yourself is to **attempt to explain it to others**. Also, many times one student will “see” one problem, while another will “see” a different problem. In this way, people working together can benefit from having access to several different viewpoints. **Form study groups with your classmates.**

Meet with your teacher when he/she is available: usually before or after school. Frequently ten minutes of work with your teacher will save hours of frustration and turmoil on your own. Your teacher is a profession educator and is trained to help you figure out your misunderstandings.

Most importantly, **don’t wait too long to get help**. Often a student will wait until halfway through a course to admit he/she needs help. At that point half of that student’s grade has already been determined. Remember, though, **it’s NEVER too late to improve!**