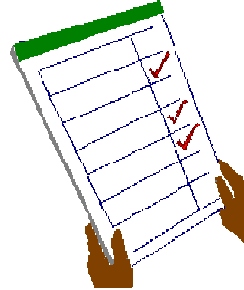


Chapter One

Classroom Rules

1.1 Classroom Preparation



Why come to class prepared?

A College math class covers material at about twice the pace that a High School course does. You are expected to absorb new material much more quickly.

Not being prepared for class gives you hard time to understand, makes you unable to participate in class and your lecture will be boring.

Before class:

- **Review your notes** from the previous lecture and reading for the day.
- **Read the text book before coming to the class** and write the objectives that come to mind at the head of your notepaper.
- **Do your homework**
- **Communicate immediately with instructors** about any study problems.

During Class:

- **Arrive on time for class.** Get seated before the arrival of your instructor.
- **Position yourself in the classroom** to focus on the subject matter; consider the best location for:
 - listening
 - asking questions
 - seeing visual materials
- **Avoid** daydreaming, looking around the room, talking to a friend, passing notes, dozing.



- **Evaluate as you listen:**
 - Decide what is important and should be placed in your notes and what can be left out.
 - Listen long enough to be sure you understand what was said before writing.
- **Write a "to do" list including:**
 - assignments (H.W. quizzes, tests,,etc)
 - reviewing difficult concepts
 - making appointments with the instructor (Office Hour)

1.2 Taking Notes in Lectures



Why take notes?

- Instructors share information not available in textbooks, and they make connections.
- Notes are a storehouse of information for later use, e.g., when you take more advanced courses.
- We remember more when we write things down.
- Taking notes helps you to listen attentively and to think critically.
- Studies show that people may forget 50% of a lecture within 24 hours, 80% in two weeks, and 95% within one month if they do not take notes.
- Note-taking is a skill required in many jobs.

How to take notes?

Before Class:

- Be organized. Carry all necessary items to class (notebook, planner, pens, pencils, calculator, etc.)
- Keep the syllabus and all course material together.
- Read the assigned textbook material.
- Shortly before class, review the last session's notes and skim the textbook.
- Begin notes for each lecture on a new page.

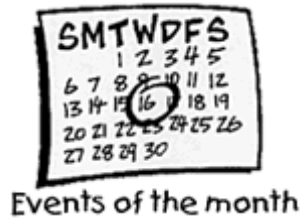
- Date each page of your notebook, and date/number each handout. Keep handouts together.
- Identify the chapter being covered and the title of lecture at the top of the page.

During Class:

- Stay focused on what the instructor is saying.
- Participate in class activities.
- Watch for clues to identify the most important information: repetition, vocal emphasis/excitement, information written on the board.
- Highlight information the professor states is important.
- Use symbols and abbreviations whenever possible.

After Class:

- Reorganize/rewrite your notes immediately after the lecture
- Add words to clarify your ideas.
- Add any additional details to help to clarify points.
- Use textbook or a friend's notes to help any missing information.
- Check for accuracy.
- Review notes regularly; information is retained better when learned in small chunks.



Chapter Two

Time Management



Being successful at the university level will probably require a more careful and effective utilization of time than the student has ever achieved before. He is expected to average about two hours of preparation for each hour in the classroom. You need to understand where your time goes, it is important to assess how you actually spend it. Time management is a skill few people master, but it is one that most people need.

2.1 Strategies on Using Time

- **Plan enough time for study**

The University expects a student to average about two hours in studying for each hour spent in the classroom.

- **Prioritize assignments**

Write down things you have to do, then decide what to do at the moment, what to schedule for later.

- **Space study periods**

Fifty to ninety minutes of study at a time for each course works best. Relaxation periods of ten or fifteen minutes should be scheduled between study periods.

- **Plan for weekly reviews**

The weekend is a good time for review.

- **Plan study periods to follow class periods**

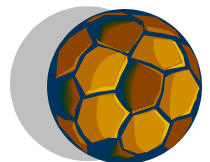
Review studies and readings just before class and immediately after class.

- **Make use of the free hours during the school**

Utilize these hours reviewing the material and editing the notes of the preceding class

- **Leave some unscheduled time for flexibility**

You need to have time to pray, rest, plan recreation on campus,...., etc.



- **Have time to sleep and eat properly**
Not having enough time for sleeping will affect your productivity. You will need a couple hours of clock time to get an hour of productive time.

2.2 Procrastination



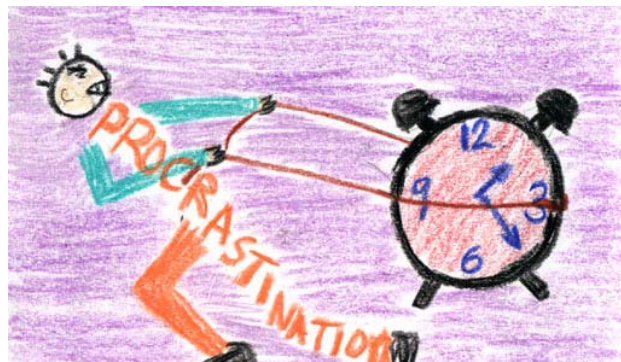
Procrastination is the avoidance of doing a task that needed to be completed. This can lead to feeling of guilt, inadequacy, depression and self-doubt and can interfere with both academic and personal success.

Why do people procrastinate?

- Poor time management
- Difficulty concentration
- Fear and Anxiety
- Negative Beliefs
- Personal Problems
- Find the task boring

How to overcome procrastination?

- Recognize self-defeating problems such as: fear and anxiety, difficulty concentrating, poor time management, indecisiveness, and perfectionism.
- Identify you own goals, strength and weakness, values and priorities.
- Discipline your self to use time wisely.
- Motivate yourself by dwelling on success, not on failure.
- Set realistic goals.



Chapter Three

Exams



3.1 Exam Preparation

Doing well on the homework does not mean that you will do well on the exam because there are factors such as:

- Answers in the back of the book
- Looking up examples, formulas, and definitions
- No time limit
- Lower stress level

Here are some tips to improve your mathematics Exam scores:

Before the Exam:

1. **Begin reviewing early**
this will give your brain time to get comfortable with the information.
2. **Attend problem sessions (when ever available)**
You can ease into more intense review session prior to major exams.
3. **Read text assignments before lectures**
this will help you identify concepts that instructor considers important and that are already somewhat familiar.
4. **Review notes immediately after lectures**
this will help you identify information that you do not understand while the lecture is still fresh in your memory. When you review immediately, you'll have time to clarify information with other students
5. **Review with a group**
this will enable you to cover important material that you may overlook on your own.
6. **Conduct a major review early enough** to allow for a visit to the instructor during his office hours if necessary.
7. **Break up the study tasks into manageable chunks**, especially during major reviews prior to exams. *Studying while you are mentally tired is usually a waste of time.*

8. **Keep a list of things to remember** - problems stressed by the instructor, definitions, terms, graphs and formulas.
9. **Study copies of old exams, chapter tests from the book**, or make up your own. Then practice them with the same limits as the real exam.
10. **Get a good night's sleep before the exam** so that you are rested and alert; a quick review before the test should be a summary only.
11. **Arrive at the test early** (at least 15 minutes) so that you can be relaxed when the exam begins.
12. **Make sure you have your complete stationary:** pencil, pen, sharpener, etc.

During the Exam:

1. Arrive early, at least 15 minutes before the exam.
2. Be comfortable, relaxed and confident.
3. Write your name, read and listen to the directions carefully.
4. Make an overview of the exam when you are told to begin.
5. Answer in strategic way, easy questions first.
6. Clearly write each step of the solution. Be neat and don't rush. Keep checking your solution as you are working.
7. If you get stuck on a problem move on and come back to it later.
8. If enough time is left, make a quick review and be sure that you didn't miss any step.

3.2 Test Anxiety



What is Test Anxiety?

Too much anxiety about a test is commonly referred to as **test anxiety**. It is perfectly natural to feel some anxiety when preparing for and taking a test. In fact, a little anxiety can jump start your studying and keep you motivated. However, too much anxiety can interfere with your studying. You may have difficulty learning and remembering what you need to know for the test. Further, too much anxiety may block your performance during the test. You may have difficulty demonstrating what you know during the test.

How Do I Know If I Have Test Anxiety?

You probably have test anxiety if you answer YES to four or more of the following:

1. I have a hard time getting started studying for a test.
2. When studying for a test, I find many things that distract me.
3. I expect to do poorly on a test no matter how much or how hard I study.
4. When taking a test, I experience physical discomfort such as sweaty palms, an upset stomach, a headache, difficulty breathing, and tension in my muscles.
5. When taking a test, I find it difficult to understand the directions and questions.
6. When taking a test, I have difficulty organizing my thoughts.
7. When taking a test, I often “draw a blank.”
8. When taking a test, I find my mind wandering to other things.
9. I usually score lower on a test than I do on assignments and papers.
10. After a test, I remember information I couldn't recall during the test.

What Can I Do About Test Anxiety?

1. Use good study techniques to gain cognitive mastery of the material that will be covered on the test. This mastery will help you to approach the test with confidence rather than have excessive anxiety.
2. Maintain a positive attitude as you study. Think about doing well, not failing. Think of the test as an opportunity to show how much you have learned.
3. Go into the test well rested and well fed. Get enough sleep the night before the test. Eat a light and nutritious meal before the test. Stay away from junk foods.
4. Stay relaxed during the test. Taking slow, deep breaths can help. Focus on positive self-statements such as “I can do this.”
5. Don't worry about other students finishing the test before you do. Take the time that you need to do your best.
6. Once you finish the test and hand it in, forget about it temporarily. There is nothing more you can do until the graded test is returned to you. Turn your attention and effort to new assignments and tests.
7. When the graded test is returned to you, analyze it to see how you could have done better. Learn from your mistakes and from what you did well. Apply this knowledge when you take the next test.

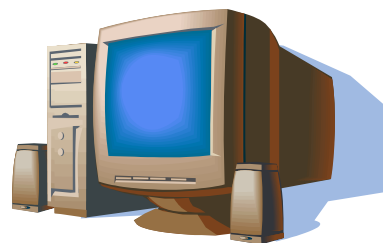
Chapter Four

Recourses

4.1 Math Prep-Year Website

One of the main reasons of teaching is to assist the students acquire knowledge. The Math Prep-Year Program constructed a webpage with address: www.kfupm.edu.sa/mathprep. It consists of much useful information. Students can benefit from this important and useful tool in many ways:

1. **Follow up the news and events:** they can know about their exam dates, location and results. Announcements of many activities that are organized by the department.
2. They can know about the **office hours and contact address of their instructors**. This will strengthen the communication between the student and his instructor.
3. **Homework solutions are posted weekly on the web**. They can follow the solutions and know their mistakes.
4. **Old Exams and online quizzes** are available on the web for students to practice and have an idea about the level of the exam questions.
5. **The Warning list is updated weekly on the web**. Students can check the list and know if they have a warning or awarded a DN grade. If a DN grade is posted, the student will have one week to present an excuse. This will minimize the number of absents and awarded DN's.
6. Students can watch **video lectures** of some problem sessions. This will be a good revision before their exams, as well as to clarify some points which were not clear during the lecture.



4.2 Computer Labs and Math Soft wares

In the Prep-Year Program there are two computer labs equipped with 60 PC's connected to the network and two head projectors. Students can use the labs in their free time to:

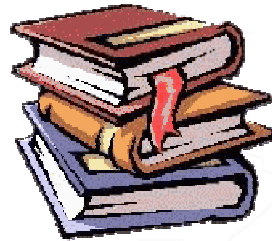
1. Browse the KFUPM, Prep-Year and Instructors websites.
2. Use the WebCT
3. Use the Larson's CD (a math software that contains explanation to textbook topics, examples with step by step solutions, exercises and video lectures.)
4. Use many math (easy to use) soft wares to help them understand the graphs and the analysis of some math problems.

4.4 Problem Sessions

Problem Sessions are held prior to exam periods. They do not cover new material. Instead, they give students a chance to develop their problem solving skills and to work through problems in a different environment than lectures.

Problem sessions are most effective when you:

1. Come prepared.
2. Ask questions.
3. Participate in solving suggested problems and comparing your solution with the instructor's solution,



4.3 Reading Your Textbooks

Reading and remembering information from textbooks can be one of the most challenging aspects of learning at university. The following facts will discuss strategies that can be effective for learning from textbooks:

1. Active Reading

Active reading requires interacting with the information, or creating an "internal dialogue" with the text. To read actively

- Comment on or ask yourself questions about points in the text
- Look for major points and supporting evidences or examples as you're reading.

2. Reading Speed and Comprehension

Many students are concerned about their reading speed. However, the speed of reading is not nearly as important as whether the reading technique that you're using is *appropriate for the task*. With a text that you are required to know thoroughly, a slow, careful pace is time-consuming but necessary for comprehension and retention. It's usually smarter to spend an hour on five pages and know the material well than to spend an hour on fifty pages and remember nothing.

3. Reading and Concentration

To improve concentrations while reading try to:

- Analyze the distractions that are interfering with it. For example, do not plan reading sessions at periods when you become sleepy or when you are on a bed.
- Plan reading sessions for times when your energy and concentration are high.
- Change your place when the distraction comes from noise or roommates.
- Plan reading sessions in short periods spread out over a period of time.
- Do not inhibit concentration by frequently checking the clock or the number of remaining pages.
- Switch tasks or take a break if you read for several times without understanding.
- Reserve a specific time to think about day dreaming issues.

4. Improve Your Knowledge of the Subject's Terminology

Any text will seem difficult to understand if you don't know the definitions of the special terms.

5. Assess Your Knowledge of the Basics

If you are struggling with an introductory course, then you may:

- Talk to your instructor to make sure that you have the necessary prerequisites and prior knowledge expected for the course.
- Check the Library for another text book on the same subject. Sometimes a different explanation of the same topic is all it takes to make the subject more accessible.

6. Read Out Loud and Discuss With a Colleague

Reading out loud can help to increase your comprehension of difficult material. If you read aloud with a classmate and take turns analyzing, explaining, and summarizing the text, you may also find that another person's perspective helps to clarify meaning.

7. Integrating Text and Lecture Notes

It is important that the material from the texts and lectures be learned together, so integrating your notes can be an important study strategy.

8. The SQ5R Method for Reading Textbooks:

- **Survey.** Read only the chapter title, subtitles, italicized terms, boldface type, and introductory or summary sections. Make mental predictions about what the titles and subtitles imply the chapter will discuss.
- **Question.** Go to the first major heading. Anticipate what will be in that section. Using the interrogatives who, what, where, when, and why, turn heading #1 into a question. Then write the question down.
- **Read.** Read the chapter section by section for the purpose of answering the question.
- **Record.** In the reader's own words and without looking at the text, write down very short cue phrases. Think about the meaning, making certain what you write is noteworthy. Use key words, key phrases, or numbering systems for parts of your answer.
- **Recite.** Cover your answer and recite it from memory.
- **Repeat.** Repeat steps 2, 3, 4, and 5 for each section in the entire chapter.
- **Review.** Recite all answers from memory. If you can't recite all of the answers from memory, keep studying until you can. Then go to question number two.

Chapter Five

Study skills



5.1 Homework Assignments

How Important Is Homework?

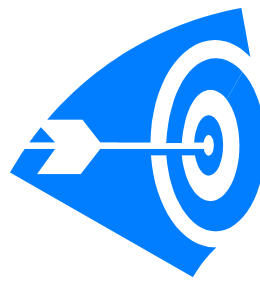
Assigning homework serves various educational needs:

1. It gives students a chance to "review and practice what they have learned
2. It allows for more in-depth exploration of topics than is possible during class time.
3. It supplements and reinforces work done in class.
4. It provides opportunities to identify and learn to use resources, such as the library, the Internet, reference books, and other community resources.
5. It serves as an intellectual discipline.
6. It helps students develop time management, study, and organizational skills.
7. It fosters student initiative, independence, and responsibility
8. It prepares students for the next day's lecture.

How to Do Your Homework?

1. It should go without saying that you should do your homework and do it on time.
2. Don't start solving the homework before studying the subject and solve the examples mentioned in the textbook.
3. Do the problems on scrap paper, check them over, and then *copy them neatly*
4. Turn in the neat copy (and, of course, be sure that your name, ID number, serial number, Math section, and the textbook section are on it!)
5. Don't just write down *answers*. Write down the problem *and* the complete solution showing *how* you arrived at your answer.
6. Do the homework at a suitable time (not at bedtime) in a suitable place where you can work away from distraction of TV etc.

5.2 Setting S.M.A.R.T. Goals



Specific:

- Well defined.
- Clear to anyone who has a basic knowledge of the subject.

Measurable:

- Know if the goal is obtainable and how far away completion is.
- Know when it has been achieved.

Attainable:

- Manageable and feasible with the resources at hand.

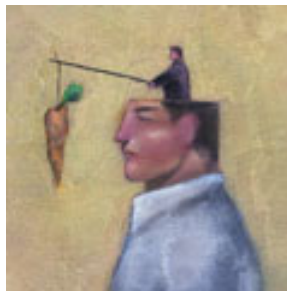
Realistic:

- Within the availability of resources, knowledge and time

Time-Bound:

- Have a clearly defined time frame for accomplishment

5.2 Self Motivation



Motivation is an internal driving force to move towards our goals. This is central to everything positive that you want to do in your life. Without self motivation you will not achieve your goals.

Why You Need Self Motivation?

- You cannot always rely on others to encourage you, if you have positive friends who are always there when you need them then you are indeed lucky and very much in the minority. If you are lonely or have few friends when you face any difficulties in your life you must rely on your own motivation to get you through. Lack of self motivation at that time could lead to depression.

- You need self motivation to achieve because if you don't encourage yourself to accept opportunity and challenge who will?
- To plan and find direction in your life.
- To take up a new activity, hobby or challenge.
- To be enthusiastic about life and living.
- To have the courage to see things through despite setbacks or negative comments from others.

This is not an exhaustive list because self motivation is so important in every aspect of your life. The very fact that you are here searching for answers and trying to improve yourself shows that you are motivated.

What If You Lack Self Motivation?

How can you become motivated again? Good question!

Here are some suggestions:

- **Focus on what you really enjoy doing**, maybe on something you want to take up or on a hobby you've always wanted to devote more time to. What's stopping you? Think about giving it priority to start doing what you love doing.
- **Make a list** of things you'd like to improve on and how you're going to do it.
- **Review all the successes you've enjoyed** in every area of your life, totally forget any negatives, just positive successes here!
- **Start an exercise program** - force yourself to do it, it'll make you feel much more positive.
- **Contact a positive friend.**
- **Read inspiring books** that will help heal your mind and improve your attitude.

Lack of motivation happens to us all!

Even the most positive of people sometimes face a situation where they lack motivation. This happens to us all because we all face the same or at least similar difficulties in life. True you may be affected more or less than others because you react differently to the challenges and setbacks which you face. It is your attitude and responses to life which dictate how you feel.

Abusive people lower your self esteem and put you down. If you live with an abusive person you are at a big disadvantage and may suffer very low confidence. The best advice is to get this abusive person out of your life, don't accept abuse ever. If you absolutely can't escape that person then you need great inner strength to stand up to it.

How to Last Motivation?

Success is not achieved accidentally. It is a systematic, deliberate process of deciding what you want to do with your life, what you will do when you get there, and what the steps are to get you where you want to be.

1. One of the most important aspects of success is the ability to visualize your path and stay focused on your goal until you reach it.
2. The sooner you envision your dreams and develop a plan to turn them into reality, the faster you will accomplish your goals.
3. Overcoming procrastination is the first step in helping you create the lifestyle you desire.
4. Several small jobs done over time are much more manageable than one large task with no end in sight.
5. Develop a filing system, rid yourself of unnecessary papers, and give yourself an organized place to work.
6. If people or outside forces distract you, use the power of the human mind to block out what impedes your progress and concentrate solely on the task at hand.
7. Review your habits and way of thinking to determine what you are visualizing most of the time. If your visions do not lead you in the direction of accomplishing your goals, then you must change them.
8. Remember this. You can sustain lasting motivation over time once you discover the motivation strategies that are right for you.

5.4 Critical Thinking



Everyone thinks; it is our nature to do so. But how much of our thinking, left to itself, is biased, distorted, partial, uninformed or down-right prejudiced. Yet the quality of our life and that of what we produce, make, or build depends precisely on the quality of our thought.

What is critical thinking?

Critical thinking is that mode of thinking - about any subject, content, or problem - in which the thinker improves the quality of his thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them.

Why Critical Thinking?

The purpose of specifically teaching critical thinking in the sciences or any other discipline is to improve the thinking skills of students and thus better prepare them to succeed in the world. Moreover, it:

- raises vital questions and problems, formulating them clearly and precisely;
- gathers and assesses relevant information, using abstract ideas to interpret it effectively comes to well-reasoned conclusions and solutions, testing them against relevant criteria and standards;
- thinks open mindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, and practical consequences; and
- Communicates effectively with others in figuring out solutions to complex problems.

How to think critically?

- uses evidence skillfully and impartially
- organizes thoughts and articulates them concisely and coherently
- distinguishes between logically valid and invalid inferences
- suspends judgment in the absence of sufficient evidence to support a decision
- understands the difference between reasoning and rationalizing
- attempts to anticipate the probable consequences of alternative actions
- understands the idea of degrees of belief
- sees similarities and analogies that are not superficially apparent
- can learn independently and has an abiding interest in doing so
- applies problem-solving techniques in domains other than those in which learned
- can structure informally represented problems in such a way that formal techniques, such as mathematics, can be used to solve them
- can strip a verbal argument of irrelevancies and phrase it in its essential terms
- habitually questions one's own views and attempts to understand both the assumptions that are critical to those views and the implications of the views

- is sensitive to the difference between the validity of a belief and the intensity with which it is held
- is aware of the fact that one's understanding is always limited, often much more so than would be apparent to one with a noninquiring attitude
- recognizes the fallibility of one's own opinions, the probability of bias in those opinions, and the danger of weighting evidence according to personal preferences
-

5.5 Material Retention



Studying is not about doing your homework. Studying is not about comprehending the material you read about in your textbooks (although that is clearly a part of it). Studying is not even about how many hours you spend studying (believe it or not!).

Studying is about retention, which involves transferring what you learn every day into your long-term memory. Doing your homework, comprehending your materials, and spending long hours in a study cubicle do not necessarily mean that you are going to remember the material you studied over the long term.

Learning effective long-term memory retention skills is what will best further your education.

How to increase the material retention?

- Taking notes.
- Review and edit your notes.
- Review the material.
- Scheduling immediate review upon completion of reading, weekly reviews, and reviews prior to examinations.
- Thinking about the material and putting it into your own words.
- Participating in class discussions.
- Pay close attention to content.
- Go to class prepared.
- Improve your listening skills.

5.6 Group Study



Study groups are often formed and run by students themselves. The general purpose of study groups is to divide a task into smaller parts and to assign each part to a member of the study group. However, it must be used in a particular way; otherwise it is frustrating and a waste of time.

Directions for forming effective study groups are given below:

1. Positive independence: sink or swim together.
2. The size of the group is important. It can involve as few as two, but a more desirable number is between three and six. Then if one member cannot make the meeting, the group can still carry on.
3. One person should act as Chair.
4. An agenda should be prepared for each meeting, with each member responsible to report on or explain a section of the reading or to give the answers to selected questions.
5. All members must do their homework of preparing for the meeting, each preparing his assigned parts, and all making themselves familiar with all the material.
6. The group meeting should be conducted to cover all the reports within the planned time – from one to two hours depending on the agenda. Each person should make his presentation so good that it "teaches" the material to the others. Then the presentation should be questioned and discussed freely and thoroughly, with everyone participating. Finally, each should make brief notes on the important ideas that were brought out.
7. The next step is to take about five minutes to talk about the value of the session, and in particular to discuss ways in which each member could make it better next time.
8. The final step is to plan the agenda for the next meeting.

Chapter Six

Mathematics

6.2 Word Problems

Word problems often trip up even the best math students. Many get stumped trying to figure out what they're looking to solve. Without knowing what's being asked, students have trouble making sense of all the critical information in the question.

Word problems are a series of expressions that fits into an equation. An equation is a combination of math expressions.

- 1. Identify What the Problem is Asking For.**
What is being asked for? Read through the problem and determine what you are trying to find.
- 2. Identify What Information is Given.**
Pay attention to all the numbers, figures, relations, etc. Draw a picture to help you visualize it if that will help.
- 3. Identify Variables and Set Up Equation.**
Some problems will require you to find more than one unknown. If so, set up multiple variables. Write down what each variable is (for instance $X =$ number of cars, $Y =$ miles driven.) If you can, set up an equation using the information given.
- 4. Ignore Extra Information.**
Sometimes a word problem will give you extra information. If you don't need something, don't worry - just ignore it!
- 5. Solve the Equation.**
Make sure you have everything in the same units (change meters to centimeters, feet to inches, etc.) Simplify your answer if possible.
- 6. Make Sure you Answered the Question.**
Double check that you solved for the right variable. Sometimes you may need to solve for two variables when the problem only asks for one.
- 7. Check Your Answer.**
Check your answer in the equation again, make sure it's in the correct units, and look to see if it makes sense.

6.3 Pre-Calculus Common Mistakes (Conceptual and Algebraic)

Mistake	Correct or Comment
ALGEBRA	
$\pi = \frac{22}{7}$ or $\pi = 3.14$	$\pi \approx \frac{22}{7}$ or $\pi \approx 3.14$ (irrational number)
$(xy)^n = xy^n$ Ex. $(2x)^3 \neq 2x^3$	$(xy)^n = x^n y^n$ Ex. $(2x)^3 = 2^3 x^3$
$(x^n)^m = x^{n+m}$ Ex. $(x^2)^3 \neq x^5$	$(x^n)^m = x^{nm}$ Ex. $(x^2)^3 = x^{2 \cdot 3} = x^6$
$(x+y)^n = x^n + y^n$, for any integer $n \geq 2$ Ex. $(2+3)^2 \neq 2^2 + 3^2$	Use the proper expansion depending on the value of n . Ex. $(x+y)^2 = x^2 + 2xy + y^2$
$\frac{x^{-1} + y^{-2}}{z^{-5}} = \frac{z^5}{x + y^2}$	$\frac{\frac{1}{x} + \frac{1}{y^2}}{\frac{1}{z^5}}$continue...
$\sqrt[n]{x+y} = \sqrt[n]{x} + \sqrt[n]{y}$, for any integer $n \geq 2$ Ex. $\sqrt{16+9} \neq \sqrt{16} + \sqrt{9}$	Do not distribute radicals over terms
$\frac{z}{x+y} = \frac{z}{x} + \frac{z}{y}$	$\frac{x+y}{z} = \frac{x}{z} + \frac{y}{z}$
$\frac{x+2}{\cancel{x}} = x+2$	Apply cancellation rule to factors only (but not terms)
$\sqrt{16} = \pm 4$	$\sqrt{16} = 4$ \sqrt{a} , where $a > 0$ has only one positive value
$\sqrt{x^2} = x$ Ex. $\sqrt{(-5)^2} \neq -5$	$\sqrt{x^2} = x $ as x can be positive or negative
$\sqrt{-4}\sqrt{-4} = \sqrt{16} = 4$	$\sqrt{a}\sqrt{b} = \sqrt{ab}$, where a and b are nonnegative
$ -x = x$ for any real number x	$ x = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

$-\frac{a}{b} = \frac{-a}{-b}$	$-\frac{a}{b} = \frac{-a}{b}$ or $-\frac{a}{b} = \frac{a}{-b}$
$\frac{2}{3}x = \frac{2}{3x}$	$\frac{2}{3}x = \frac{2x}{3}$
$-2^n = 2^n$, n is an even positive integer Ex. $-3^2 \neq 9$	$-2^n = -1 \cdot 2^n$ Ex. $-3^2 = -1 \cdot 3^2 = -9$
$-(9)^{1/2} = 3i$	$-(9)^{1/2} = -3$ and $(-9)^{1/2} = 3i$
$a(x-1) - b(1-x) = (x-1)(a-b)$	$a(x-1) - b(1-x) = a(x-1) + b(x-1)$ $= (x-1)(a+b)$
SOLVING EQUATIONS	
$x^2 = x \Rightarrow x = 1$ (canceling x from both sides)	$x^2 = x \Rightarrow x^2 - x = 0 \Rightarrow x(x-1) = 0 \Rightarrow x = 0$ or $x - 1 = 0$ (Never divide by a variable as it can be equal to 0)
$(x-1)(x+1) = 8 \Rightarrow (x-1) = 8$ or $(x+1) = 8$	$(x-1)(x+1) = 8 \Rightarrow x^2 - 1 = 8 \Rightarrow x^2 - 9 = 0 \Rightarrow$ $(x-3)(x+3) = 0 \Rightarrow (x-3) = 0$ or $(x+3) = 0$
Apply the quadratic formula to solve: $x^2 - 3x + 4 = 2x$ $\therefore a = 1, b = -3, c = 4$	$x^2 - 3x + 4 = 2x \Rightarrow x^2 - 5x + 4 = 0$ $\therefore a = 1, b = -5, c = 4$ (write the equation in the form $ax^2 + bx + c = 0$ before applying the quadratic formula)
Given the equation $\frac{5x}{2x-1} = \frac{15}{2x-1} + 4$ multiply the equation by $2x-1 \Rightarrow 5x = 15 + 4$	Given the equation $\frac{5x}{2x-1} = \frac{15}{2x-1} + 4$ multiply the equation by $2x-1 \Rightarrow 5x = 15 + 4(2x-1)$
$\frac{1}{x} \leq x \Rightarrow x^2 \geq 1$ (multiply both side by x)	$\frac{1}{x} \leq x \Rightarrow x - \frac{1}{x} \geq 0 \Rightarrow \frac{x^2 - 1}{x} \geq 0 \Rightarrow \frac{(x-1)(x+1)}{x} \geq 0$ now find the critical values and test the signs
EXPONENTIAL AND LOGARITHMIC FUNCTIONS	
$\log x^2 = 2 \log x$, where x is any real number	$\log x^2 = 2 \log x $
$10^{2 \log x} = 2x$	$10^{2 \log x} = 10^{\log x^2} = x^2$
$\log x + \log y = \log(x+y)$	$\log x + \log y = \log xy$
$\log x + \log y = \log z \Rightarrow x + y = z$	$\log x + \log y = \log z \Rightarrow xy = z$
$-\log xy = -\log x + \log y$	$-\log xy = -(\log x + \log y)$

TRIGONOMETRY

$\sin(x + y) = \sin x + \sin y$	$\sin(x + y) = \sin x \cos y + \cos x \sin y$
$\sin 3x = 3 \sin x$	$\sin 3x \neq 3 \sin x$
$\frac{\sin x}{x} = \sin 1$	can not be simplified
$\sin^n x = \sin x^n$	$\sin^n x = (\sin x)^n$
$\sin^{-1} x = \frac{1}{\sin x}$	No such relation
$\tan^{-1} x = \frac{\sin^{-1} x}{\cos^{-1} x}$	No such relation
$\csc^{-1} x = \frac{1}{\sin^{-1} x}$	No such relation
$\sec^{-1} x = \frac{1}{\cos^{-1} x}$	No such relation
$\cot^{-1} x = \frac{1}{\tan^{-1} x}$	No such relation
$\cos^{-1} - x = \cos^{-1} x$	$\cos^{-1} - x = \pi - \cos^{-1} x$

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