STUDY SKILLS FOR MATH-RELATED COURSES.

PREVIEWING

Before class briefly preview the text material that will be covered in the lecture.

1. Get an overview of the material by reading the introductory and summary passages, section headings and subheadings, and diagrams.
2. Look at the problems at the end of the chapter.
3. Make note of new terms, theorems, and formulas.
4. Review (if necessary) old terms, theorems, and formulas referred to in the new material.
5. Formulate possible questions for class.

Remember, the purpose of previewing is not to understand the material but to get a general idea of what the lecture will cover. This should not be a very time-consuming process.

NOTETAKING

When taking notes in class, listen actively; intend to learn from the lecture.

1. Write down the instructor's explanatory remarks about the problem.
    a. Note how one gets from one step of the problem to another.
    b. Note any particular conditions of the problem.
    c. Note why the approach to the problem is taken.
    d. Note any drawings, graphs, or charts.
2. Try to anticipate the consequences of a theorem or the next step in a problem. During a proof, keep the conclusion in mind.
3. Note any concepts, rules, techniques, and problems that the instructor emphasizes.
4. Question your instructor during class about any unclear concepts or procedures.
5. If you miss something in the lecture or don't understand what's being presented, then write down what you can catch—especially key words. Be sure to skip several lines so you can fill in the missing material later.
6. As soon as possible after class, summarize, review, and edit your notes.
    a. Quickly read through your notes to get an overview of the material and to check for any errors or omissions.
    b. Fill in any information—especially explanatory remarks (see #1 above)—that you did not have time to write down or that the instructor did not provide.

c. Use the margin or the back of the opposite page to summarize the material, list key terms, theorems, and formulas, and rework examples. You can also use this space to take notes from the textbook.

d. Note any relationship to previous material; i.e., write down key similarities and differences between concepts in the new material and concepts in previously learned material.

7. Review your notes at regular intervals and review them with the intent to learn and retain.

TEXT READING

If your class lectures provide a good overall structure of the course, you can use your text to clarify and supplement your lecture notes. In order to create a single study source, insert the notes you take from the text into your lecture notes themselves as well as in the margins or the back of the opposite page.

If your text provides the best overall structure of the material, then you can use your lecture notes as the supplementary source. In either case consider the following procedures:

1. Briefly preview the material. Get an overview of the content and look at the questions at the end of the chapter.

2. Read actively and read to understand thoroughly.

   a. Formulate questions before (from lecture notes or from previewing) and read to answer those questions.

   b. Know what every word and symbol means.

   c. Translate abstract formulas to verbal explanations or graphic representations.

   d. Analyze the example problems by asking yourself these questions:
      - What concepts, formulas, and rules were applied?
      - What methods were used to solve the problem? Why was this method used?
      - What was the first step?
      - Have any steps been combined?
      - What differences or similarities are there between the examples and homework problems?

   e. Further analyze the example problems by using the following procedures:
      - Explain each step using your own words. Write these explanations on paper.
      - Draw your own diagrams to illustrate and explain problems.
      - For practice, write down example problems from your books. Close the book and try to work the problems. Check your work with the example to find what concepts, rules, or methods you are having trouble with.

   f. Check to see how the material relates to previous material. Ask yourself these questions:
      - How was the material different from previous material?
      - How was it the same?
      - What totally new concepts were introduced, and how were they applied?
      - Where does this material "fit" within the overall structure of the course?

3. Stop periodically and recall the material that you have read.

4. Review prerequisite material, if necessary.

PROBLEM SOLVING

Solving problems is usually the most important aspect of math-based quantitative courses. You must, therefore, spend much of your study time either working or studying problems. When working a problem, follow these steps:

1. Read through the problem at a moderate speed to get an overview of the problem.
2. Read through the problem again for the purpose of finding out what the problem is asking for (your unknown). Be able to state this in your own words.
3. If appropriate, draw a diagram and label it.
4. Read each phrase of the problem and write down (symbolically or otherwise) all information that is given.
5. Devise a tentative plan to solve the problem by using one or more of the following tactics:
    a. Form relationships among all facts given. (Write an equation that includes your unknown.)
    b. Think of every formula or definition that might be relevant to the problem.
    c. Work backwards; ask yourself, "What do I need to know in order to get the answer?"
    d. Relate the problem to a similar example from your textbook or notes.
    e. Solve a simpler case of the problem using extremely large or small numbers; then follow your example as if it is an example from the text.
    f. Break the problem into simpler problems. Work part of the problem, and see if it relates to the whole.
    g. Guess an answer and then try to check it to see if it is correct. The method you use to check your answer may suggest a possible plan.
    h. If you are making no progress, take a break and return to the problem later.
6. Once you have a plan, carry it out. If it doesn't work, try another plan.
7. Check your solution.
    a. Check to see if the answer is in the proper form.
    b. Insert your answer back into the problem.
    c. Make sure your answer is "reasonable."

During the problem solving process, it is often helpful to say out loud all of the things you are thinking. This verbalization process can help lead you to a solution.

PROBLEM ANALYSIS

After you have worked a problem, analyze it. This can help sharpen your understanding of the problem as well as aid you when working future problems.

1. Focus on the processes used (not the answer) and ask yourself these questions:

    a. What concept, formulas, and rules did I apply?

    b. What methods did I use?

    c. How did I begin?

    d. How does the solution compare with worked examples from the textbook or my notes?

    e. Can I do this problem another way? Can I simplify what I did?

2. Explain each step using your own words. Write these explanations on your paper.

TEST PREPARATION

If you have followed an approach to study as suggested in this handout, your preparation for exams should not be overly difficult. Consider these procedures:

1. Quickly review your notes to determine what topic/problems have been emphasized.

2. Look over your notes and text. Make a concept list in which you list major concepts and formulas that will be covered.

3. Review and rework homework problems, noting why the procedures were applied.

4. Note similarities and differences among problems. Do this for problems within the same chapter and for problems in different chapters.

5. Locate additional problems and use them to take a practice test. Test yourself under conditions that are as realistic as possible (e.g., no notes, time restriction, random sequence of problems, etc.). Also, try to predict test questions; make up your own problems and practice working them.

TEST TAKING

1. Glance over the whole exam quickly, assessing questions as to their level of difficulty and point value. Also get a sense of how much time to spend on each question. Leave time at the end to check your work.

2. Begin to work the problems that seem easiest to you. Also give priority to those problems that are worth the most points.

3. Maximize partial credit possibilities by showing all your work.

4. If you have a lapse of memory on a certain problem, skip the problem and return to it later.

TEST ANALYSIS

Analyzing returned tests can aid your studying for future tests. Ask yourself the following questions:

1. Did most of the test come from the lecture, textbook, or homework?

2. How were the problems different from those in my notes, text, and homework?

3. Where was my greatest source of error (careless errors, lack of time, lack of understanding material, uncertainty of which method to choose, lack of prerequisite information, test anxiety, etc.)?

4. How can I change my studying habits to adjust for the errors I am making?

IMPORTANT: The knowledge of most math/science courses is cumulative. Many concepts build on previous concepts, and a poor understanding of one concept will likely lead to a poor understanding of future concepts. Keeping up with your homework is essential. Consequently, you should seek help early if you encounter difficulty.