Schaum's Outline for Calculus, 5th Edition – Reading Guide

Remember that I am not asking you to really do anything but read. For each chapter, I am going to point out a few highlights or make a few comments. In each chapter, don't DO the problems but look to see WHAT TYPE of problems are being asked in the solved problems section.

Chapter 1 – Linear Coordinate Systems
Be sure to be comfortable with interval notation, i.e. know the difference between (3,5) and [3,5)

Chapter 2 – Rectangular Coordinate Systems
This should really be totally review. Another name for the "rectangular" coordinate system is the "Cartesian" coordinate system. The midpoint formula will have some interesting applications for linear functions and will mess people up if they apply the same concept to non-linear functions. Notice that the coordinate axes are perpendicular and form a plane. Any two lines that intersect also can describe a plane, yet they do not form the basis for a coordinate system. Why? Hmmm

Chapter 3 – Lines
Equation of a line. Slopes of parallel and perpendicular lines. 'Nuf said

Chapter 4 – Circles
General equation of a circle. A solid understanding of circular geometry is critical for the last half of the course. Just as importantly, it is important to realize that a circle belongs to a family of functions, which leads us to….

Chapter 5 – Equations and their Graphs
The conic sections! The conic sections are of supreme importance. You should be able to recognize the shape of the graphs of these from their equations and vice versa. Really read the solved problems here. These problems go into significant detail with the specifics of the geometries. They will describe these graphs in terms of the locus concept as well. You get good vocab about the parabola and ellipse as well. You will also see the concept of eccentricity which will become important. These solved problems are great.

Chapter 6 – Functions
Function vocabulary is important. We will recast the concept of a function to mean something very specific in our work. Think about why the concept itself of a function is critical. The chapter shortchanges the concept of a rigorous definition of a function. We are not going to be mathematically rigorous but we will be philosophically rigorous. It is important to understand the concept of domain restrictions. What sorts of mathematical structures indicate domain restrictions. What could be the physical interpretation of a domain restriction?

Chapter 7 – Limits
This is where things might start to get new for the 444 folk; this should be old hat to the 444HH peoples. As a note, we are NOT, repeat NOT going to bother with formal delta-epsilon (δ and ϵ respectively…these are the lower case versions of these letters) work. You'll do that in your calc classes. The important thing is to really understand that the value of the limit can exist at a point even if the function has no value at that point. Additionally, what is the limit itself? It isn't a

function per se. Think about that. This is a chapter to read very closely. Some of the sample problems get needlessly complicated for our work. Anywhere you see an absolute value, a delta or an epsilon, just don't even bother.

Chapter 8 – Continuity

The concept is as simple as it looks. It is just as important for us to understand continuity as discontinuity. Make a note of the different forms of discontinuities and the equations that indicate these structures. Where in nature (being that physics is a series of mathematical structures used to describe nature) would you see discontinuities? The intermediate value theorem is both obvious yet wonderful. The solved problems are good at demonstrating the types of equations that would cause you to suspect discontinuities. This is going to link back into the concept of restricted domains from Chapter 6

Chapter 9 – The Derivative

Ok. This is the biggie. Once again, old hat to the 444HH kids. New to the 444. This is it. Crucial. Huge. Important. 444 folk, please don't think you need to know or understand all of this stuff. Try to get the major gist here and a grasp of the notation. First and foremost notice that the definition of the derivative (middle of page 73) uses the concept of the limit. Notice what the limit is acting on…it's the slope equation. So that's the big idea. The derivative is intimately related to the concept of slope. It is therefore a description of change. How does y change as x changes. Look through the many many many notations. The reason there are so many notations is 1) the concept is super flexible and 2) two people originally developed the concept simultaneously and used different notations. In the sample problems, notice there is a hellish amount of algebra (see 4 – 8). We will write things a little differently but we won't avoid the hellish algebra. Sample problem 9 is critical for really understanding the concept as opposed to the operational mechanics of it all.

Chapter 10 – Rules for Differentiating Functions

This chapter is where we get to learn short cuts to avoid the horrid algebra that was the focus of Chapter 9 but first we will learn to do things the hard way so we appreciate the short cuts. Be sure to look at what the rules allow you to do rather than focusing on what they actual are from an operational level. Don't focus on the first way they articulate the chain rule (with composite functions…which always make my skin crawl), look at what they call the "alternate formulation" which I consider to be the best way to look at it in the first place. Remember, please don't scrutinize the sample problems. Look at what they ASK rather than what they DO.

Chapter 11 – Implicit Differentiation

This one is a tough read. Solved problems 1 and 2 come closest to getting at what I am trying to get you to see here. Don't worry if you don't get it though. This concept comes into play when you have a function where the two variables in the function are actually both functions of a different variable (i.e. if you have a rectangle whose sides are expanding, both the length and width are functions of time)

Chapter 12 – Tangent and Normal Lines

This chapter starts to get into the applications of the derivative. Look carefully through the concept of slopes of tangents. Ignore angles of intersection.

Chapter 13 – Law of the Mean. Increasing and Decreasing Functions
Pages 98 and 99 are really important for our application work. Finding extrema. Rolle's
Theorem. Good stuff! Not so much Theorem 13.5 and 13.6 on page 100. Increasing and
decreasing functions are important and largely overlooked vocabulary. In the Solved Problems,
don't focus on the "prove" ones so much as the applications.

Chapter 14 – Maximum and Minimum Values
This chapter gives more critical applications. The first page of this reads confusingly. The second
page, especially the "First Derivative Test" section with the graphs is great. Don't worry about
the "Tabular Method". Solved problems 2, 3 and 4 are great. Skip 5 – 8. 9 is an interesting. Then
you get into the min/max problems of 10 – 22 which are neat. Please don't read all of them. It is
the same problem over and over again with different geometries. Instead, pick 3 of them
randomly and see if you can figure out the general METHODOLOGY of how all of them are
solved.

Chapter 15 – Curve Sketching. Concavity. Symmetry
This chapter is pretty straightforward. The concept of the concavity of a graph is going to be
critical. It's also pretty easy. The symmetry stuff is interesting but not vital. The "Hints for
Sketching the graph of G…" is great. Solved problems 6, 7 and 8 are great.

Chapter 16 – Review of Trigonometry
I will 100% take for granted that you know all of this cold. This chapter also reinforces the
concept of polar coordinates as transformations from Cartesian coordinates. This is worth
knowing. Please don't feel you need to have memorized the trig identities but you want to be
comfortable enough with them so that when they pop up in a problem, which they often do, that
you will intuitively say "Oh, that's a trig identity!" If that spark of recognition isn't there, you
will get to certain points in certain problems and instead say "Hunh?!?"

Chapter 17 – Differentiation of Trigonometric Functions
Once again, a gimme for the 444HH people. For the 444 folk, look at the section on the graphs
and it will make a lot more sense than the formal discussion of the limits on the first page of this
chapter. This chapter will present rules that we will prove together. Don't read too closely. This
is more a "be familiar with the fact that we can do the derivative to these functions" rather than
HOW to do it.

Chapter 20 – Related Rates
The 444HH people have probably done these problems and are in pain even seeing this on this
list. These problems are NOT AS BAD AS YOU HAVE BEEN LEAD TO BELIEVE. For those
of you that have never seen these, all I want you to do here is read a few of what the problems
are. I want you to recognize what a related rates problem looks like. DO NOT READ THE
SOLUTIONS. Seriously. Don't. It's not that the explanations are obscure or difficult. It is just
that I present these in a very particular way and I want your head uncluttered of preconceived
misconceptions which I fear you will get by reading the solutions. I just want you to get a feel for
the types of questions that qualify as related rates….notice in each, the rate at which one quantity
changes is related to the rate at which another quantity changes, hence the name. By the way, not
all derivatives are rates. Think about that.

Chapter 22 – Antiderivatives
This isn't the most kindly presented concept. Essentially, this process is just undoing the derivative. Mostly here, I just want you to get a sense of the notation. Quickly visually compare these rules to the derivative rules on 79. We will make more explicit comparisons. Once again, DO NOT THINK YOU NEED TO KNOW HOW TO DO THESE. I just want people to not have their eyes cross the first time I start throwing out these words and notations.

So there you have it. We will cover all of the material above in 10 – 12 class periods. This covers the majority of the concepts from the AB calculus course. We will then make a dent into the BC work.

I reemphasize – DON'T DO PROBLEMS. This is about familiarity with notation and vocabulary. THAT IS ALL.