SIMUW Theory of Equations: References

I've put copies of the course handouts on the web at

`http://research.microsoft.com/~cohn/Courses/TheoryOfEquations/`.

Here are some reading suggestions (if you read them, you'll notice that some of the problems and proofs from this class were taken from these books).

1. *Algebra* and *Trigonometry*, by I. M. Gelfand and A. Shen. These are high school textbooks. What makes them notable is that Gelfand is a famous mathematician. Unlike any other high school texts I've seen, these books really explain things the way mathematicians think about them. There are more books in this series (anything by Gelfand will be excellent).

2. *Discourses on Algebra*, by I. Shafarevich. This book starts where high school leaves off, and goes considerably further. I haven't read it, but it looks like it does a great job of putting things in context.

3. *Algebra*, by M. Artin. This is a pretty difficult college-level book, but it's my favorite introduction to abstract algebra. It's full of great examples.

4. *Basic Notions of Algebra*, by I. Shafarevich. This book is a survey of abstract algebra. Don't try it until you've read a book like Artin's (and don't confuse it with *Discourses on Algebra*).

5. *A Friendly Introduction to Number Theory*, by J. H. Silverman. This book is the most readable introduction to number theory I've seen.

6. *The Cauchy-Schwarz Master Class*, by J. M. Steele. This great new book tells everything you'd ever want to know about inequalities (not just the Cauchy-Schwarz inequality). The first few chapters should be readable now, although it gets more sophisticated by the end.

7. *How To Solve It*, by G. Pólya. Pólya was a brilliant mathematician and a great teacher. In this book he explains how to go about solving problems, with a lot of wonderful examples.

8. *Journey Through Genius*, by W. Dunham. This book explains a lot of important mathematical discoveries from the past, and puts them in historical context. Among many other things, it explains how Euler computed the sum
$$1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \dots.$$

9. *The Pleasures of Counting*, by T. W. Koerner. Every book by T. W. Koerner is great (if you major in math you should track down and read his book *Fourier Analysis* someday, although it takes some background). This one is no exception. It's pretty elementary but has a lot of amazing examples of analyzing things mathematically, including everything from biological scaling to codebreaking in World War II.

10. *The Book of Numbers*, by J. Conway and R. Guy. Everything Conway does is fascinating. (You may be familiar with his game called Life, which is one of his minor discoveries.) Most books on numbers (for example properties of particular numbers, patterns, etc.) are a little dull, because they often take everything out of context. This one is great.

11. *Calculus*, by M. Spivak. This book is the only introduction to calculus that I like. Even if you know calculus you should read this book, because Spivak does everything rigorously (and in an especially elegant and clear way). He also throws in a lot of interesting commentary, related results, reading suggestions, etc.

12. *Elementary Geometry From An Advanced Standpoint*, by E. Moise. This book does high school geometry rigorously, and then goes on to a number of advanced topics (such as trisecting the angle or hyperbolic geometry).

13. *Discrete Mathematics: Elementary and Beyond*, by L. Lovász, J. Pelikán, and K. Vesztergombi. A beautiful, very readable introduction to combinatorics, and discrete mathematics more generally.

14. *Concrete Mathematics*, by R. Graham, D. Knuth, and O. Patashnik. This is one of my favorite mathematics books. It has lots of amazing examples and exercises, and a fantastic choice of topics.

15. *Proofs from the BOOK*, by M. Aigner and G. Ziegler. "If I see a really nice proof, I say it comes straight from the Book... God has a transfinite Book, which contains all theorems and their best proofs, and if He is well intentioned toward those [mathematicians], He shows them the Book for a moment. And you wouldn't even have to believe in God, but you must believe that the Book exists." – Paul Erdős. This book present candidates for inclusion in the Book.