

0 Preface

I'm working through Spivak Calculus. Around the chapter on epsilon-delta limits the details get pretty confusing. I started supplementing with David Galvin's notes, which are often more clear but are still confusing. This is surprising because the topic of limits doesn't use anything beyond basic middle school math. Feels like it should be simple! And so I started writing these notes to properly understand the damned thing.

Some departures from the structure of Spivak's text:

- I start with limits here.
- The very first chapter in these notes covers prerequisites necessary to study limits—some really basic limits intuitions, and material on bounding values with inequalities.
- In general each chapter in Spivak weaves between introducing concepts, exploring degenerate cases, showing examples of practice problems, and proving theorems. In my view this is delightful if you already understand the material, but distracting if you're trying to understand it for the first time. So instead I separate these categories into clear sections. I introduce concepts and proofs as quickly as possible (i.e. “the blessed path”), then have a separate section on edge cases, etc. I tend to skip and backtrack a lot through Spivak's material. The order of these notes reflects the order in which I internalized Spivak's text.
- This sometimes happens not only within a chapter, but also across chapters. Chapters 7 (Three Hard Theorems) and 8 (Least Upper Bounds) are swapped in these notes. Spivak first introduces the Intermediate Value theorem and the Extreme Value theorem as facts, then proves their consequences, then introduces completeness and its consequences, and finally proves IVT and EVT. I find it distracting and confusing. I introduce completeness and its consequences first. I then introduce and prove IVT and EVT, and finally cover their consequences. IMO this approach is much less confusing than Spivak's.
- Spivak covers various of trigonometric functions as he goes through the book. In the early chapters I found it distracting as I didn't know any trig. I eventually buckled down and learned enough, and then revisited everything I skipped. I go through this exercise in chapter 8 of these notes.
- I break up derivatives into four chapters instead of three. The additional chapter is on the Leibniz notation. The issues of notation are sufficiently confusing that I found it difficult to study the concept of derivatives and two notational systems at the same time. Also, Leibniz notation requires considerable practice to internalize. So it gets its own chapter.