Prelim 1 material

The material on the exam may include most of the first five chapters of the book, along with anything in the class notes (including things that were ultimately discussed in section).

The book does state some facts that I did not bring up explicitly in class. You should still know most of those facts; and, as I mentioned at the start of class, you should remember some things from calculus. Specifically:

- *Background*: The calculus mentioned in the book is handy! You should surely be comfortable with Taylor series, including Taylor's theorem with remainder. In addition, you should know the geometric series, the Taylor expansions for sine, cosine, and exponential about zero, and the series expansion for $\ln(1+x)$. I'm not going to quiz you on these things directly; but as you've seen, they do come up in examples.

- *Chapter 1*: You should know everything in there, though as a matter of practicality not all the material lends itself to good exam questions.

- *Chapter 2*: I will not ask you about chopping, or about the parameters of IEEE single precision. I will also not ask you to design another floating point reading. Beyond what's in the book, you should know a few additional facts that we discussed in lecture and brought up in exercises (e.g. $x - y$ is computed without additional rounding error when x and y are within a factor of two of each other).

- *Chapter 3*: You should know everything in this chapter. Note that when I refer to the "rate constant" for a linearly convergent fixed point iteration, I usually mean the asymptotic contraction ρ; the book defines the rate as $\log_{10} \rho$. The two numbers convey the same information, and I will try to make sure any questions that I ask on the topic are unambiguous. Beyond what's in the book, you should understand the ideas for coming up with initial guesses and bisection intervals that came up in the notes, in class, in section, and in the homework.

- *Chapter 4*: You should know everything through 4.3, though I will not grill yu on complex arithmetic or eigenvalue problems. We'll get to the SVD later in the class, and likewise with the examples in the last section of the chapter. Beyond the material in the text, you should understand the ideas about efficient formulations of linear algebraic computations that we mentioned in class and in the homework. On the theoretical side, you should understand the linear algebra concepts I described in class from the perspective of the space of polynomials $\mathcal{P}_d$ as well as $\mathbb{R}^n$.

- *Chapter 5*: You should know 5.1–5.3 and 5.8, plus some basics about sparse matrices (which you're getting through Project 1). I'm more concerned that you should be able to safely and effectively use the results of LU factorization than that you should be able to write your own efficient Gaussian elimination codes. That means understanding something about the relative cost of different operations (e.g. factorization vs. triangular solves) and also understanding basic error bounds and the concept of condition numbers.