Bare Essentials

At the end of this chapter you should be able to

1. Identify which addition, subtraction, and multiplication operations are legal for vectors and matrices.
2. Manually carry out legal addition, subtraction, and multiplication operations involving vectors and matrices
3. Apply transpose operators to vectors and matrices.
4. Manually compute each of the vector norms, L_1, L_2, and L_∞.
5. Compute and compare lengths of vectors with the L_2 norm.
6. Manually compute the inner product of two vectors.
7. Use an inner product to verify whether two vectors are orthogonal.
8. Use an inner product to verify whether two vectors are orthonormal.

To perform basic linear algebra with MATLAB you will need to

9. Define vector and matrix variables with assignment operations
   - involving `[ ...]`, and using spaces, commas, and semicolons (as appropriate) to separate row and column elements.
   - using built-in functions that return vectors and matrices.
10. Extract vector and matrix elements with subscripts.
11. Use colon notation to create ranges of subscripts, and thereby extract or assign element values *en masse*.
12. Use MATLAB syntax to add, subtract, and multiply vectors and matrices.
13. Use the L_2 norm to write a MATLAB expression to test whether two vectors are "equal to within a tolerance".

An Expanded Core of Knowledge

After mastering the bare essentials you should move on to a deeper understanding of the fundamentals. Doing so involves being able to

1. Use row- and column-oriented algorithms for matrix–vector, vector–matrix, and matrix–matrix multiplication.
2. Express conditions of linear dependence of vectors (row or column) in terms of matrix rank.

To perform more advanced linear algebra operations with MATLAB you will need to

3. Express products of matrices with vectors and other matrices using colon notation to make the row and column operations explicit.

Developing Mastery

Working toward mastery of linear algebra you will need to

1. Integrate the linear algebra operations from Chapter 7 with the material from Chapter 8 and Chapter 9. In particular, be able to express row-wise operations in Gaussian elimination using colon notation.