# Chapter 1. Linear Spaces and Operators
## Study Guide

The following is a brief list of topics covered in Chapter 1 of Promislow's *A First Course in Functional Analysis*. This list is not meant to be comprehensive, but only gives a list of several important topics. You should also carefully study the proofs given in class and the homework problems.

**Section 1.1. Introduction.**
Where this class lies in a conventional analysis education; the informal ideas of a function, operator, and functional.

**Section 1.2. Linear Spaces.**
Complex numbers and properties, definition of linear space, $A + B$ and $\alpha A$ where $A$ and $B$ are sets, subspace, finite linear combinations, span of a set, basis, finite dimensional linear space, linearly independent, our notation for vectors.

**Section 1.3. Linear Operators.**
Definition of linear operator, null space/kernel, range/image, surjective (onto), injective (one to one), one to one as it relates to the null space, linearity of $T^{-1}$ when it exists, the linear space of linear operators $\mathcal{L}(X, Y)$.

**Section 1.4. Passage from Finite- to Infinite-Dimensional Spaces.**
Concerns over divergence.

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