

**MATH 341, SPRING 2016**  
**REVIEW FOR THE SECOND EXAM**

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1. OVERVIEW

The exam will cover Axler, sections 1.C, 2.A, 2.B, 2.C, 3.A, 3.B, and 3.C. There will be a short-answer question and then the remainder of the questions will be proof-based or conceptual.

2. THINGS TO KNOW

- (i) The definition of a subspace of a vector space; how to check if a subset is a subspace.
- (ii) How to define and recognize sums and direct sums of subspaces.
- (iii) The definition of a span; the characterization of span as the smallest subspace containing the given set of vectors.
- (iv) The definition of linear independence (and dependence).
- (v) The fact (and proof) that the length of any linearly independent set in a vector space is shorter than the length of a spanning set.
- (vi) The definition of a basis.
- (vii) The fact that any linearly independent set can be expanded to a basis and any spanning set can be contracted to a basis.
- (viii) The definition of the dimension of a vector space.
- (ix) The definition of a linear map; how to check if a map is linear.
- (x) The definition of the kernel (null space) and image (range) of a linear map.
- (xi) What it means for a map to be injective or surjective.
- (xii) The correspondence between matrices and linear maps.

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