Topics for Exam 2

1. **Spaces of Matrices**
   - 1.1 Matrix Algebra
   - 1.2 Null space and nullity
   - 1.3 Column and row spaces
   - 1.4 Rank
   - 1.5 Invertibility
2. **Linear Transformations**
   - 2.1 Definition of linearity
   - 2.2 Matrix representation
   - 2.3 Null space and image
   - 2.4 Compositions
   - 2.5 Invertible linear transformation
   - 2.6 Orthogonal transformations
     - 2.6.1 Orthogonal matrices
     - 2.6.2 Determinant, cross–product and triple–scalar product
     - 2.6.3 Areas and volumes
     - 2.6.4 Area and volume preserving transformations
     - 2.6.5 Orientation
     - 2.6.6 Orientation preserving transformations
     - 2.6.7 Orthogonal, orientation preserving transformations in $\mathbf{R}^2$
3. **The Eigenvalue Problem**
   - 3.1 Eigenvalues, eigenvectors and eigenspaces
   - 3.2 The eigenvalue problem
   - 3.3 Invariant subspaces
   - 3.4 Orthogonal, orientation reversing transformations in $\mathbf{R}^2$.

Relevant sections in text: 1.6, 5.1, 5.2, 6.1, 6.2, 6.3, 7.2 and 8.1

Relevant chapters in the online class notes: Chapters 3, 4, and 5

Important Concepts: linear transformation, null space, image, nullity, rank, elementary matrices, invertibility, eigenvalue, eigenvector and eigenspace

Important Skills: know how to tell whether a given matrix is invertible or not, know how to compute inverses of invertible matrices, know how to determine whether a given function is linear or not, know how to obtain matrix representations of linear transformations, know how to compute nullity and rank of matrices, know how to compute determinants of 2×2 matrices, know how to find eigenvalues, eigenvectors and eigenspaces of linear transformations.