

Review sheet for Exam 2

This exam will cover Sections 1.8, 1.9, 2.1, 2.2, 2.3, 2.8, 3.1.

- You **will** be asked to state the definitions of the following terms. Use precise language; to be safe, you may want to use the definitions straight from the text.
 1. One-to-one and onto.
 2. Subspace of a vector space.
 3. Basis for a subspace.

- Other vocabulary that you should be familiar with:
 1. Linear (transformation).
 2. Standard matrix for a linear transformation.
 3. Matrix multiplication.
 4. Invertible matrix.
 5. Elementary matrix.
 6. Column space of a matrix.
 7. Null space of a matrix.
 8. Determinant.

- From Sections 1.8 and 1.9:
 1. You may be asked to determine whether or not a given transformation is linear, and to prove your answer is correct. (See for example Section 1.8 #29, 30, 32, 33, 35, 36 and Quiz 4.
 2. You may be asked to give the standard matrix for a linear transformation. See for example Section 1.9 #1-11, #17-20 and Quiz 5.
 3. You may be asked to determine whether or not a given linear transformation is one-to-one and/or onto.

- From Section 2.1: You may need to use the definition of matrix multiplication on the top of page 110 to answer questions about the product of two matrices. See for example Section 2.1 #17-26.

- From Section 2.2:
 1. You may be asked to find the inverse of a matrix.
 2. You **will** be asked to use matrix algebra and the properties of inverses and transposes to solve matrix equations or answer questions. See for example Section 2.2 #13-20.
 3. *Tip: In some of these questions, the trick is to use a fact from Theorem 6 that says the product of invertible matrices*

is invertible, the inverse of an invertible matrix is invertible and the transpose of an invertible matrix is invertible.

- From Section 2.3:
 1. You **will** be asked questions addressing the concepts covered in the invertible matrix theorem. See for example Section 2.3 #13-32.
 2. Note: The questions from this material will often use material from Sections 2.1 and 2.2.
 3. You may be asked to determine whether or not a linear transformation is invertible, or to find the inverse of an invertible linear transformation.

- From Section 2.8:
 1. You **will** be asked to determine whether or not a given subset of \mathbb{R}^n is a subspace. See for example Section 2.8 #1-4 and Examples 1, 2 and 3.
 2. You **will** be asked to find a basis for the column space or the null space of a matrix. See Section 2.8, Examples 6, 7 and 8 and #23-26. See also Examples 5, 6 and 7 on page 230.
 3. You may be asked to give an example of a vector in the null space and/or a vector in the column space of a given matrix. See for example Section 2.8 #13, 14.
 4. You may be asked to determine if a given set of vectors is a basis for \mathbb{R}^n . See for example Section 2.8 #15-18.

- From Section 3.1: You **will** be asked to take the determinant of a matrix, possibly larger than 3×3 .