

# Linear Algebra Homework Problems

## Module 1

### Introduction

Section 1.1: 1, 5, 8, 9, 13, 23, 27, 30, 37, 38, 39, 41, 43, 49

### Matrices

Section 3.2: 9, 11, 23, 24, 41, 43, 44, 47, 49, 78

Section 3.3: 35, 36, 37, 39, 51, 53, 57, 67

Section 2.2: 13, 15

### Matrix Addition and Scalar Multiplication

Section 3.2: 1, 5a, 15, 19, 20, 21, 22

-- End Week 1 – Due Sept 6; Begin Week 2 --

### Transposition

Section 3.2: 2, 5b, 65, 69

Section 3.3: 42

Section 11.5: 28

### Partitioned Matrices and Linear Combinations

Section 3.2: 37, 39,

Section 2.1: 1, 3, 5, 21, 25, 27, 31, 32

Section 2.2: 17

### Special Kinds of Matrices

Section 8.3: 1, 3, 5, 7, 50a,

Section 3.2: 52, 53, 56, 57, 75, 76

Section 11.1: 1, 3, 5, 7, 9, 13, 27

-- End Week 2 – Due Sept 11; Begin Week 3 --

### Row Equivalence

Section 1.2: 1, 3, 5, 7, 9, 11, 13, 15, 19, 21, 23, 25, 27, 31, 33, 37, 39, 41, 53

Section 2.2: 29, 31

### Elementary Matrices and Matrix Inverses

Section 3.3: 5, 9, 11, 13, 15, 19, 29, 51, 53, 55, 58, 59, 60

Section 3.2: 41, 42

-- End Week 3 – Due Sept 18; Begin Week 4 --

### Column Equivalence

No Homework – This section is for reference only and not material that is tested.

## Module 2

### Introduction

Section 8.1: 1, 3, 7, 9, 17, 19, 21

Section 7.1: 4, 11, 13, 33, 34

Section 4.1: 21, 23, 25, 27, 29, 31, 32, 37, 45, 46, 49

-- End Week 4 – Due Sept 25; Begin Week 5 –

### Subspaces

Section 2.2: 1, 3, 7, 9, 21, 25, 35, 37, 39, 43, 47, 49, 51, 53, 58

Section 4.3: 1, 2, 3, 4 (We'll define *basis* later – for now just find the three spaces it asks for)

Section 4.1: 1, 3, 5, 7, 13

-- End Week 5 – Due October 2; Begin Week 6 –

Week 5 homework: If turned in by Thursday 8am, score is multiplied by 1.10.

\*\*\*End Test 1 Material\*\*    \*\*Begin Test 2 material\*\*

### Linear Independence and Bases

Section 2.3: 1, 2, 3, 5, 7, 11, 13, 17, 19, 20, 21, 22, 23, 24, 25, 29, 31, 33, 37, 38, 41, 44, 53, 57

Section 4.2: 1, 2, 3, 4, 5, 7, 9, 11, 15, 17, 19, 23, 27, 33, 37, 40

-- End Week 6 – Due Oct 9; Begin Week 7 –

### Rank and Dimension

Section 4.2: 29, 31, 60

Section 4.3: 1, 3, 5, 9, 11, 13, 15, 17, 18, 19, 20, 21, 23, 25, 27, 29, 31, 35, 37, 43, 47, 49, 59, 61

Section 8.4: 35(a)

### Coordinate Systems

Section 4.4: 1, 3, 5, 7, 9, 11, 13, 25, 15, 17, 27, 19, 21, 29, 23, 31, 33, 37, 49

Section 9.3: 1, 2, 3, 5, 9, 11

Section 9.4: 1, 2, 4, 5

(Optional) Section 9.4: 3, 6, 9

-- End Week 7 – Due Oct 16; Begin Week 8 –

## Module 3

### The Definition of the Determinant

Section 5.2: 1, 3, 5, 7, 19, 35, 41, 45, 47b, 49, 51b, 52, 53, 57

Section 5.1: 35, 37, 39, 61, 63, 69a, 70a, 71a, 72b, 74,

-- End Week 8 – Due Oct 23; Begin Week 9 –

### Computing the Determinant

Don't worry about the notation regarding  $M_{ij}$  and  $C_{ij}$  yet. Just find the determinant of these matrices.

Section 5.1: 1, 7, 11, 13, 17, 19, 23

### Adjoins and Inverses

Section 5.3: 1, 3, 5, 7, 9, 13, 15, 17, 37, 38, 41, 43, 44, 49

### Determinant and Rank

There are no problems specific to this section – but expect them to come up unexpectedly under the context of applying the Big Theorem.

## Module 4

### The Definition of a Linear Transformation

Section 3.1: 1, 3, 5, 7, 9, 11, 13, 14, 15, 16, 17, 21, 23, 25, 27, 29, 33, 35, 37, 39b, 40, 41, 42, 43, 48b, 50, 57, 61, 62, (Optional 66 OR 67)

Section 3.2: 13, 21, 27

Section 4.1: 41, 43, 47b

Section 4.3: 21, 23, 24

-- End Week 9 – Due Oct 30; Begin Week 10 –

No homework Week 10; Test Friday November 3<sup>rd</sup>.

Study for the test.

-- End Week 10; Begin Week 11 –

### Matrix representation of Linear Transformations

Section 4.1: 33, 46b, 47a

Section 4.3: 22

Section 9.3: 13, 15, 16, 18, 19, 21, 23, 35\*, 37, 41, 46\*\*

Section 9.4: 9, 11

\*Recall that  $P_2$  is a polynomial vector space. Look back to previous modules if you don't recall what it is

\*\*Hint: Construct a similar diagram as we did during class, using  $T$  as the identity.

-- End Week 11; Begin Week 12 – Due after Thanksgiving Break--

### Composition and Inverses of Linear Transformations

Section 9.1: 1, 3, 11, 13, 15, 17, 12, 23, 24, 27, 31, 32, 33, 34, 35, 36, 37, 39

Section 9.2 practice: 3

Section 9.2: 1, 3, 5, 11, 15, 17, 19, 23, 31

### Eigenvalues and Eigenvectors

Section 6.1: 1, 3, 5, 7, 9, 11, 15, 17, 21, 25, 31, 33, 37, 41, 43

## Module 5

We covered these two sections quickly at the end of the semester. Because we didn't have any time for questions and discussion on the material, the homework and test questions will be kept very simple. Look at these problems and be able to compute what they ask for; we won't have any conceptual questions on these topics on the test.

### Orthogonality and the Gram Schmidt Process

Section 8.1: 1, 2, 3, 7

Section 8.2: 7, 8, 9, 10, 11, 13

### Diagonalization

Section 6.2: 9, 10, 11, 12, 13, 14, 15, 17

Problems in red are problems that I found and added after the homework was due. They're not required, but you should probably go back and do them just to make sure you learned that material.

Problems marked in purple as optional are problems that you can solve with the material we cover. They're interesting in some way – perhaps an application or example. However, it's not worth our time to talk about that specific application or example so we're not going to. You might try them anyway to reinforce your understanding of the concepts by applying them to things we haven't seen in class!!