

Assignment 9

Applied Linear Algebra Math 232 - D100 (Fall 2012)

Quiz date: Friday, November 23

Complete this assignment by Monday in your *homework journal*. This will give you plenty of time to make sure you understand the material before the quiz at the end of Wednesday's class. Quiz questions will be taken from items 1 (Questions from Textbook) or 2 (Additional Questions) below.

To obtain maximum marks on the quiz, your answer should be in a form that another student could understand without undue effort: a poorly expressed but correct result is not sufficient.

1. Questions from textbook:

<i>section</i>	<i>question</i>	<i>done</i>	<i>checked</i>	<i>corrected</i>	<i>study MT</i>	<i>study final</i>	<i>type 1</i>	<i>comment</i>
7.1	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	see Example 3 in the text
	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	see Example 3 in the text
	5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	replace “the canonical basis” with “a basis”
	9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	replace “the canonical basis” with “a basis”
	D1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CE	for part (a), assume A is not the zero matrix
	D4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CE	
7.2	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	this is in conjunction with Theorem 7.2.7
	11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
7.3	1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	7	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	compare parametric equations (see p. 32) and span
	23	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	D1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	“ $A \cap B$ ” means the intersection of A and B
	D4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	
	D5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RE	

¹See the legend on last page of this assignment for what these acronyms mean.

2. Additional questions:

These questions are made up by your instructor and may require a blend of ideas that we have encountered so far in the course. They are similar to exam style questions in that it is not entirely clear what part of the text is directly related to solving the problem. You will have to decide what tools/techniques are required.

A1. Let $\mathbf{v}_1 = (1, 2, 1)$, $\mathbf{v}_2 = (-1, -4, 2)$, $\mathbf{v}_3 = (1, 1, 2)$.

- (a). Show that $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is a linearly independent set.
- (b). Show that $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ is a basis of \mathbb{R}^3 .
- (c). Express each of $\mathbf{e}_1 = (1, 0, 0)$, $\mathbf{e}_2 = (0, 1, 0)$, and $\mathbf{e}_3 = (0, 0, 1)$ as a linear combination of $\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$.
- (d). Write the matrix A whose columns are \mathbf{v}_1 , \mathbf{v}_2 , and \mathbf{v}_3 (in that order), and find A^{-1} .
- (e). Do you see any connection between parts (c) and (d)?

A2. Let \mathbf{v}_1 , \mathbf{v}_2 , and \mathbf{v}_3 be as defined in problem A1. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be a linear transformation with $T(\mathbf{v}_1) = (1, -1)$, $T(\mathbf{v}_2) = (2, 5)$, and $T(\mathbf{v}_3) = (0, 1)$.

- (a). What is $T(\mathbf{e}_1)$? (Hint: use your answer from A1(c), and the properties that T has as a linear transformation.)
- (b). What is the matrix $[T]$ representing T ?
- (c). What is $T(1, 3, -1)$?

3. Extra-Practice Questions:

Try these questions for some more practice. The more practice you get the better you will understand the material and the better you will do on quizzes and exams.

- Section 7.1: 11 (for the notation \mathbf{a}^\perp , see “Hyperplanes” on pp. 138–139 of the text), D2, D3
 - Section 7.2: 7, 19
 - Section 7.3: 3, 9, 13, 15, 17, 29, D7, D8, D9
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Legend (for “type” of question):

RE = Routine Exercise: This is something you should be able to do in your sleep ;-). Your goal is to be able to answer these questions quickly and accurately every time. These form the foundations of your skill set.

TC = Time Challenge: Speed and accuracy are important factors in solving this type of routine exercise. Try to do these exercises within the time limit, usually 5 minutes. If you need more time than that, its o.k., but keep practicing! Solving these routine exercises provides a foundation for solving more involved problems, and is essential in performing well on quizzes and exams.

WP = Word Problem: Translating words into expressions (also known as modeling): Master this skill now, we will be using this all term.

CD = Concepts and Definitions: These questions relate to your understanding of the “new language” we are introducing. They should help you remember the important definitions and theorems.

CE = Concepts and Explorations: This indicates a question which is testing your understanding of the fundamentals. It is not a routine exercise since the solution process may not be obvious at first glance. It may take a little bit of thought to figure out what to do, don’t be afraid to play around with some ideas. You’ll learn more by making mistakes and taking routes which lead to dead ends. You must be able to do these types of questions to succeed in learning this material.

HL = Higher Level Understanding: This indicates a question which is testing understanding at a higher level. These questions will require more thought than a RE or CE so don’t be discouraged if you can’t see how to do this immediately. Perseverance and playing around with ideas is the key to these questions. Understanding this material at this level is an expected outcome of this course.

CM = Computer of Computational Device: This indicates a question in which a computer or calculator is needed.