

Linear Algebra (MATH 3333) Fall 2007 Sections 1/4

Homework 5 — Practice Problems

Not to be turned in

Instructions: Try the following on your own, then use the book and notes where you need help. You will be able to check solutions online and bring any questions you may have to Wednesday's class. For Sections 1 and 2, no explanations are necessary. For all other problems, justify your work.

1 True/False

1. T F If A, B, C are $3 n \times n$ matrices, then $(AB)C = A(BC)$.
2. T F If A is an $m \times n$ matrix, then it defines a linear transformation from \mathbb{R}^m to \mathbb{R}^n .
3. T F \mathbb{R}^n is a vector space.
4. T F Any line in \mathbb{R}^2 is a linear subspace of \mathbb{R}^2 .
5. T F In \mathbb{R}^2 , scaling by k (in all directions) and then rotating by θ clockwise is the same as rotating by θ clockwise and then scaling by k .

2 Short Answer

6. Write down the definition of a linear transformation from \mathbb{R}^2 to \mathbb{R}^2
7. State the definition of a linear subspace of \mathbb{R}^n .
8. Geometrically, list three kinds of linear transformations in \mathbb{R}^2 ?
9. What is linear algebra?
10. Geometrically, describe the action of the matrix $A = \begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$?

3 Problems

11. Determine the domain, range and image of the linear transformation $A = \begin{pmatrix} 2 & 0 \\ 1 & 3 \\ -1 & 1 \end{pmatrix}$.
12. What does the transformation $A = \begin{pmatrix} 2 & 0 \\ 1 & 3 \\ -1 & 1 \end{pmatrix}$ do to the line $y = x$, i.e., what is the image of the line $y = x$ under the transformation A ?
13. Prove the circle $\{(x, y) | x^2 + y^2 = 1\}$ is not a linear subspace of \mathbb{R}^2 .
14. Let L be the union of the xy -plane and the yz -plane in \mathbb{R}^3 . Is L a linear subspace of \mathbb{R}^3 ? Justify your answer.
15. Go over Homeworks 1–4, and make sure you can do the problems correctly on your own. There will be very similar problems on the exam. (Don't worry about #34 on Homework 3 though.)