MATH 304: Linear Algebra

Instructor: Dr. Jean Marie Linhart
http://piazza.com/tamu/spring2014/math304sections504and508/home

Homework assignment 1 – due Tuesday 1/21/2014

Note: Homework is meant to be challenging. You may need practice with some easier problems before attempting these. If so, go to the end of this assignment, and you will find what problems I recommend you do to get started.

Instructions: To get full credit for these problems, you will have to write some sentences with explanations and examples, not just formulas. Take professional pride in what you hand in; your homework should be neat and well-organized, do your scratch work on scratch paper first, then neatly copy your final solution onto the paper you intend to hand in. Homework should be stapled in the upper left corner, and your name and section should be in the upper right corner of the first page.

Problem 1.

a) Section 1.1, problem 9 (Consistent defined on p. 2) **(2 points)**

b) Section 1.1, problem 10 **(2 points)**

c) Section 1.1, problem 11 **(2 points)**

Problem 2. Define (in your own words) what a homogeneous linear system is and give an example. Do homogeneous systems always have a solution? Why or why not? **(4 points)**

Problem 3.

a) Section 1.2, problem 9 **(2 points)**

b) Section 1.2, problem 17 **(2 points)**

Problem 4.

a) Define/describe overdetermined and underdetermined systems. **(2 points)**

b) Give an example of an overdetermined system that is inconsistent. **(1 point)**

c) Give an example of an overdetermined system that is consistent. **(1 point)**

d) Give an example of an underdetermined system that is inconsistent. **(1 point)**

e) Give an example of an underdetermined system that is consistent. **(1 point)**

Problem 5. (This problem is taken from a problem set of Patrick Bahls)

An $n \times n$ matrix M with entries m_{ij} is *diagonal* if $m_{ij} = 0$ if $i \neq j$. Every off diagonal entry is 0.

Let D be an arbitrary diagonal matrix. Let $D^2 = DD$, and $D^3 = DDD$, hence if k is an integer D^k is a product of k copies of D. Can you come up with a formula for D^t for any positive number t? I suggest you start by playing with some small examples and seeing what happens, then consider more general cases as you gain intuition.

(4 points)

The rest of these problems are not handed in. But do them. Trust me, you won't regret it.

Section 1.1: do as many as you can stand, but at the very minimum practice with 3d, 5d, 6gh, 7, 8.

Section 1.2: again, as many as you can stand, but at minimum practice with 1aceg, 2ce, 5acegi, 6b, 8,10, 11, 13, 14, 15, 16, 20

1. Define row echelon form. Give 3 different examples of matrices in row-echelon form, and 3 counterexamples each violating a different criterion, with a brief explanation of which criteria are violated.

2. Define reduced row-echelon form, and give 3 different examples and 3 counter examples each violating a different criterion of reduced row-echelon form, along with a brief explanation of which criteria are violated.