

**Math 2030, Matrix Theory and Linear Algebra I, Winter 2014**

**Homework 1**

**Due: Wednesday, January 15, 2014**

**Part I: True or false questions**

Decide whether each statement is true or false. If it is false, give a reason.

For part I,  $u, v, w$  are non-zero vectors in  $\mathbb{R}^3$ , and  $c$  is a scalar.

1.  $\|cv\| = c\|v\|$ .
2. Say the angle between  $u$  and  $v$  is obtuse and the angle between  $v$  and  $w$  is acute. Then  $u \cdot w < 0$ .
3. If  $u$  is a unit vector then  $\text{proj}_u v$  is  $(v \cdot u)u$ .
4. All vectors of length  $\pi$ , with tail at the origin, and perpendicular to a given vector are contained in a planar, circular disk with area  $\pi^3$ .

**Part II: Detailed answer questions.**

5. Say that  $0 < \theta < \frac{\pi}{2}$ , where  $\theta$  is the angle between two non-zero vectors  $u$  and  $v$  in  $\mathbb{R}^3$ . Prove that  $\|u - v\| < \|u\| + \|v\|$ . Note that “ $<$ ” means “less than and not equal”.

**Part III: Book questions**

Do the following questions from the textbook:

- 1.1 #42, 54;
- 1.2 #12, 16, 42, 50.