

MA203 Linear Algebra – Assignment 1

January 26, 2017, Lecturer: Claas Röver

Hand in your solution at the beginning of the lecture on **Friday, 3 Feb 2016**.

QUESTION 1. Given $u = (2, -3, 4)$, $v = (-1, 5, -2)$ and $w = (-3, 1, 4)$ in \mathbb{R}^3 , find

- (a) the norm of $u + v$, i.e. $\|u + v\|$,
- (b) a vector of length one which is parallel to w ,
- (c) a parametric equation for the plane through the points u , v and w , and
- (d) which, if any, of the points $p = (8, -19, 16)$ and $q = (-8, 21, -12)$ lies on the line through u and v .

QUESTION 2. (a) Give the definition of the dot product of two vectors $u, v \in \mathbb{R}^n$ and say how it can be used to find the angle between u and v .

(b) Describe all vectors $u \in \mathbb{R}^3$ such that $(3, 2, 1) \cdot u = 2$ and $u \cdot (1, 2, -1) = 1$.

Hint: Let $u = (x, y, z)$, find a system of linear equations and solve it.

QUESTION 3. Is it true that, if the n -dimensional non-zero vectors p and q are perpendicular to each other, then $p + q$ is perpendicular to $p - q$? If not, find a condition that makes it true?

QUESTION 4. Solve the following system of linear equations

$$\begin{array}{rccccrcr} -w & +2x & -3y & & & & = -13 \\ 3w & & +2y & +z & & & = 16 \\ & -3x & & 2z & & & = 11 \\ 2w & -2x & +y & -z & & & = 5 \end{array}$$