

**MSc. Applications of Mathematics**

## Linear Algebra - Homework 5

(Due on 17/02/2017)

## Instructions:

- Solutions must be complete and legible in order to earn maximum points.
- You may discuss and work together if necessary but you must write your own solutions. Copied solutions (from each other or books or the internet) are easy to identify and easier to grade as they can only earn a zero.

(For problems 1 and 2, check your answers using Scilab. Mention the Scilab code you use.)

1. Find the QR factorization of  $A = \begin{pmatrix} 3 & 3 & 2 \\ 4 & 4 & 1 \\ 0 & 6 & 2 \\ 0 & 8 & 1 \end{pmatrix}$  using Gram-Schmidt orthogonalization.

2. Find the QR factorization of the following matrix using Householder matrices:

$$A = \begin{pmatrix} 1 & 1 \\ 1 & 2 \\ 1 & 3 \end{pmatrix}$$

3. Let  $u$  be a unit vector in  $\mathbb{R}^n$  and let  $H_u$  be the Householder matrix associated with  $u$ . Show that

$$\det(H_u) = -1.$$