

## Homework Set 8

**Due Nov 17**

Q1. Find all real  $2 \times 2$  matrices that commute with

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$$

Q2. A vector  $x \in V$  is called cyclic for  $A$  if the span of  $x, Ax, A^2x, \dots, A^{k-1}x$  is  $V$  for some  $k$ . Show that if dimension of  $V$  is  $n$ , then  $k$  has to be equal to  $n$ . Show that if  $A$  is diagonal  $A$  has a cyclic vector if and only if the diagonal entries are distinct, i.e. no two are equal.