

## Linear Algebra

### Homework Set 1. Due Sept 22

Q1. Show that a scalar field  $K$  is vector space of dimension 1 over  $K$  and any nonzero element of  $K$  is a basis for this vector space.

Q2. Show that the set of real numbers  $R$  is a vector space over the field  $Q$  of rational numbers. Is  $R$  finite dimensional over  $Q$ ? Prove your answer.

Q3. If  $X$  is the space of all polynomials  $p(t)$  in one real variable  $t$ , of degree at most 10, and  $Y$  is the sub-space of polynomials that vanish at the points 1, 2 and 3 provide a subspace complementary to  $Y$  in  $X$ . Is it unique? Is its dimension uniquely determined? Can you show that the space of polynomials of degree at most 2, is one such complementary subspace.