Math 54 Quiz 7
GSI: Lionel Levine
2/9/04   Name:

1. Which of the following sets are vector spaces? For the ones that aren't
   vector spaces, find one of the vector space axioms that fails to hold.

   (a) The set of all pairs (x, y), where x and y are real numbers, with the
       usual addition, but scalar multiplication defined by

       $$r(x, y) = (r^2 x, r^2 y)$$

       for all real numbers r.

   (b) The set of all 2×2 matrices $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ satisfying

       $$A \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix},$$

       with the usual addition and scalar multiplication.

   (c) The set of all invertible 2×2 matrices, with the usual addition and
       scalar multiplication.