

## Solution Sketch for Practice Test 1

1. Many e.g.  $((0, 1), (1, 0))$  and  $((0, 2), (2, 0))$  and  $((0, 3), (3, 0))$ .

3. (a) True.

(b) False ( $\mathbf{C}^4$  as a vector space over  $\mathbf{R}$  has dimension 8).

(c) True.

(d) False (but true if  $V$  is finite-dimensional).

4.  $V = \mathbf{R}$  and  $W = \mathbf{R}^5$  (or vice versa)

5. (a)  $(1)$  and  $(1, x)$

(b)

$$\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 2 \\ 0 & 0 & 0 \end{pmatrix}$$

(c) Since the matrix is upper-triangular, all eigenvalues are 0

(d)

$$\begin{pmatrix} -1 & \frac{1}{2} & -\frac{1}{2} \\ 1 & \frac{1}{2} & \frac{3}{2} \\ 1 & -\frac{1}{2} & \frac{1}{2} \end{pmatrix}$$

6. (a) The identity

(b) The rotation operator in  $\mathbf{R}^2$  (given by  $T(x, y) = (-y, x)$ )