

**Course 2E2 2007-08 (SF Engineers & MSISS & MEMS)****S h e e t 2**

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Due: at the end of the tutorial

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**Exercise 1**

Find the matrix for the linear transformations  $T$  defined by the equations

(i)  $w_1 = x_1, \quad w_2 = x_1 - x_2,$

(ii)  $w_1 = 3x - z, \quad w_2 = -z, \quad w_3 = 3y,$

(iii)  $w_1 = x_4, \quad w_2 = x_4 + x_3, \quad w_3 = x_4 + x_3 + x_2, \quad w_4 = x_4 + x_3 + x_2 + x_1,$

and by the formulas

(iv)  $T(x_1, x_2) = (-x_1, x_2),$

(v)  $T(x_1, x_2, x_3) = (x_2, -x_1, x_2 - x_1, 2x_1, -7x_3).$

**Exercise 2**

Find  $T(\mathbf{x}) = A\mathbf{x}$  for the matrix  $A$  and the vector  $\mathbf{x}$  whenever the product makes sense (i.e. the sizes of  $A$  and  $\mathbf{x}$  fit together):

(i)  $A = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}, \quad \mathbf{x} = \begin{pmatrix} 1 \\ -1 \end{pmatrix},$

(ii)  $A = \begin{pmatrix} 0 & 1 & 0 \\ 3 & 0 & -1 \end{pmatrix}, \quad \mathbf{x} = \begin{pmatrix} 2 \\ -1 \\ 0 \end{pmatrix},$

(iii)  $A = \begin{pmatrix} 1 & -4 & 0 \\ 1 & 4 & -1 \end{pmatrix}, \quad \mathbf{x} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$