October 27, 2008 Lecturer Dmitri Zaitsev Michalemas Term 2008

Course 2E2 2008-09 (SF Engineers & MSISS & MEMS)

S h e e t 2

Due: at the end of the tutorial

Exercise 1

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

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

(iii) $A = \begin{pmatrix} 1 & 3 & 0 \\ 1 & 4 & -1 \end{pmatrix}$, $\mathbf{x} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

Exercise 2

Use matrix multiplication to find:

(i) the reflection of the vector $(2, -4)$ about the x-axis;

(ii) the orthogonal projection of the vector $(2, -1)$ to the y-axis;

(iii) the image of the vector $(-1, 1)$ under rotation through the angle $-\frac{\pi}{3}$ about the origin.

(iv) the image of the vector $(2, 1, -1)$ under rotation through the angle $\frac{\pi}{4}$ about the z-axis.