

Course 2E02 2010 (SF Engineers & MSISS & MEMS)

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

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

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

Exercise 2

Use matrix multiplication to find:

- (i) the reflection of the vector $(1, -3)$ about the y -axis;
- (ii) the orthogonal projection of the vector $(1, -3)$ to the x -axis;
- (iii) the image of the vector $(1, -2)$ under rotation through the angle $\frac{\pi}{3}$ about the origin.
- (iv) the image of the vector $(1, 2, -1)$ under rotation through the angle $-\frac{\pi}{4}$ about the z -axis.