

MAU22E01 2019 (SF Engineers & MSISS & MEMS)**S h e e t 3**

Due: at the end of the tutorial

Exercise 1

Use matrix multiplication to find:

- (i) the reflection of the vector $(-3, 1)$ about the x -axis;
- (ii) the reflection of the vector $(2, -1, 0)$ about the xy -plane;
- (iii) the reflection of the vector $(2, 1, 0)$ about the z -axis;
- (iv) the orthogonal projection of the vector $(1, -2, 2)$ to the xz -plane.

Exercise 2

Use matrix multiplication to find:

- (i) the image of the vector $(2, -3)$ under rotation through the angle $\frac{\pi}{4}$ about the origin.
- (ii) the image of the vector $(1, 2, 1)$ under rotation through the angle $-\frac{\pi}{3}$ about z -axis.
- (iii) the image of the vector $(1, 2, -1)$ under rotation through the angle $-\frac{\pi}{3}$ about x -axis.
- (iv) the dilation of the vector $(1, -2, 0, 4, 1)$ by the factor 2.
- (v) the contraction of the vector $(1, -2, 0, 4, 1)$ by the factor 2.

Exercise 3

- (i) Find parametric equations for the line spanned by the vector:

$$\mathbf{u} = (-1, 2, 3).$$

- (ii) Give a system of linear equations that determines the line in (i).
- (iii) Find an equation for the plane generated (spanned) by the vectors:

$$\mathbf{u} = (-1, 0, -2), \quad \mathbf{v} = (-1, 3, 0).$$