March 2, 2014 Lecturer Dmitri Zaitsev Hilary Term 2014

Course 2E02 2014 (SF Engineers & MSISS & MEMS)

S h e e t 6

Due: at the end of the tutorial

Exercise 1

Calculate the length of $\mathbf{u} = (1, 0, 1)$, the distance between $\mathbf{u}$ and $\mathbf{v} = (0, 0, -1)$ and the angle between $\mathbf{u}$ and $\mathbf{v}$

(i) with respect to the standard dot product;

(ii) with respect to the inner product given by $\langle \mathbf{u}, \mathbf{v} \rangle = u_1 v_1 + 2u_2 v_2 + 3u_3 v_3$.

Exercise 2

Which of the following bases are orthogonal and which are orthonormal (with respect to the standard dot product)?

(i) $(3, 0)$, $(0, -1)$;

(ii) $(0, 0, -1)$, $(-1, 1, 0)$, $(-1, -1, 0)$;

(iii) $(1, 0, 0)$, $(0, -\frac{3}{5}, -\frac{4}{5})$, $(0, \frac{4}{5}, -\frac{3}{5})$;

Exercise 3

Calculate the coordinates of $\mathbf{v}$ relative to the orthogonal basis

$$\{(1, 0, 0), (0, 2, -3), (0, 3, 2)\} :$$

(i) $\mathbf{v} = (2, -1, -3)$;

(ii) $\mathbf{v} = (-1, -1, 1)$.