MAU22E01 2019 (SF Engineers & MSISS & MEMS)

S h e e t 7

Due: at the end of the tutorial

Exercise 1

Calculate the length of $\mathbf{u} = (1, 0, 2)$, the distance between $\mathbf{u}$ and $\mathbf{v} = (0, 1, -1)$ 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 $\langle \mathbf{u}, \mathbf{v} \rangle = u_1 v_1 + 4 u_2 v_2 + u_3 v_3$.

Exercise 2

Determine which expression $\langle \mathbf{u}, \mathbf{v} \rangle$ provides an inner product in $\mathbb{R}^2$:

  (i) $\langle \mathbf{u}, \mathbf{v} \rangle = 4 u_1 v_1 - u_2 v_2$;

 (ii) $\langle \mathbf{u}, \mathbf{v} \rangle = 2 u_1 v_1 + u_2 v_2$;

(iii) $\langle \mathbf{u}, \mathbf{v} \rangle = u_1^2 + v_1^2$.

Exercise 3

Which of the following bases are orthogonal with respect to the standard dot product?

  (i) $(1, 4)$, $(-4, 1)$;

 (ii) $(0, 0, -1)$, $(2, -2, 0)$, $(3, 3, 0)$;

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