

Course 2E01 2018 (SF Engineers & MSISS & MEMS)**S h e e t 7**

Due: at the end of the tutorial

Exercise 1

Calculate the length of $\mathbf{u} = (1, 0, 1)$, 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 $\langle \mathbf{u}, \mathbf{v} \rangle = 4u_1v_1 + u_2v_2 + u_3v_3$.

Exercise 2

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

- (i) $\langle \mathbf{u}, \mathbf{v} \rangle = 2u_1v_1 + u_2v_2$;
- (ii) $\langle \mathbf{u}, \mathbf{v} \rangle = 2u_1v_1 - u_2v_2$;
- (iii) $\langle \mathbf{u}, \mathbf{v} \rangle = u_1 + u_2 + v_1 + v_2$.

Exercise 3

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

- (i) $(-3, 1), (1, 3)$;
- (ii) $(0, 0, -1), (2, -2, 0), (1, 1, 0)$;
- (iii) $(-1, 0, 0), (0, \frac{3}{5}, \frac{4}{5}), (0, \frac{4}{5}, -\frac{3}{5})$.