

### Properties of Inner Products

Let  $\mathbf{v}$ ,  $\mathbf{w}$  and  $\mathbf{u}$  be vectors in  $\mathfrak{R}^n$ , and let  $\alpha$  be a scalar. Then:

- (a)  $\langle \mathbf{v}, \mathbf{w} \rangle = \langle \mathbf{w}, \mathbf{v} \rangle$ ,
- (b)  $\langle \mathbf{v} + \mathbf{w}, \mathbf{u} \rangle = \langle \mathbf{v}, \mathbf{u} \rangle + \langle \mathbf{w}, \mathbf{u} \rangle$ ,
- (c)  $\langle \alpha \mathbf{v}, \mathbf{w} \rangle = \alpha \langle \mathbf{v}, \mathbf{w} \rangle = \langle \mathbf{v}, \alpha \mathbf{w} \rangle$ ,
- (d)  $\langle \mathbf{u}, \mathbf{u} \rangle \geq 0$  and  $\langle \mathbf{u}, \mathbf{u} \rangle = 0$  if and only if  $\mathbf{u} = \mathbf{0}$ .