

# Inner Products and Orthogonality

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## The inner (dot) product.

If  $u$  and  $v$  are vectors in  $\mathbf{R}^n$ , then the *dot product* or *inner product* of  $u$  and  $v$  is

$$u \cdot v = u^T v = u_1 v_1 + \cdots + u_n v_n.$$

For example if

$$u = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}, v = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}$$

then

$$u \cdot v = (2)(1) + (3)(-1) + (-1)(0) = 2 - 3 = -1 \dots$$