1 | Cauchy-Schwarz Inequality important

'One of the most important inequalities in mathematics'

Suppose $u, v \in V$ (where V is an inner product space). Then

$$|\langle u, v\rangle| \leq \|u\|\|v\|$$

The inequality is an equality iff one of u, v is a scalar multiple of the other.

1.1 | proof is by the orthogonal decomposition

1.2 | results

1.2.1 | triangle inequality

Suppose $u, v \in V$. Then

$$\|u + v\| \leq \|u\| + \|v\|$$

The inequality is an equality if and only if one of u, v is a non-negative multiple of the other (degenerate triangle)