Section 3.3. Examples of Inner Product Spaces

Note. We give several examples of inner product spaces.

Example 3.3.1. $\mathbb{C}$ is an inner product space with $(x, y) = x\overline{y}$.

Example 3.3.2. $\mathbb{C}^n$ is an inner product space with $(x, y) = \sum_{k=1}^{n} x_k \overline{y}_k$.

Example 3.3.3. The space ℓ^2 of all square summable complex sequences is an inner product space with $(x, y) = \sum_{k=1}^{\infty} x_k \overline{y}_k$. As we'll see, all infinite dimensional vector spaces (with a few additional details) are isomorphic to ℓ^2.

Example 3.3.6. The space $L^2([a, b])$ of all Lebesgue square integrable functions on $[a, b]$ is an inner product space with

$$(f, g) = \int_a^b f(x)\overline{g(x)}\, dx.$$

We'll do our quantum mechanics in L^2.

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