

Homework Set 3. Due Friday September 16, 2021 at 10.30

1. Consider the vectors

$$e_1 = \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \quad e_2 = \begin{pmatrix} 1 \\ -i \end{pmatrix}. \quad (1)$$

a) Show that e_1 and e_2 are linearly independent and calculate $g_{\mu\nu} = (e_\mu, e_\nu)$. The inner product is defined as $(x, y) = \sum_k x_k^* y_k$.

b) Expand the vector

$$\begin{pmatrix} i \\ 3 \end{pmatrix} \quad (2)$$

in this basis.

2. Do exercise (A.8) of Goldbart and Stone

3. Using the orthonormal basis, $(1, 0)$ and $(0, 1)$, find the matrix of the projection operator on \mathcal{R}^2 that projects onto $(1, -1)$.