1. *(Optional):* Work out all the steps of the Sturm-Liouville approach for the example $L(h) = -h''$ for the interval $[0, \pi]$ subject to the boundary conditions $B(a) : h(0) = 0$ and $B(b) : h(\pi) = 0$. In particular
   (a) Determine the solutions $h_a$ and $h_b$ of $L(h) = 0$ for the initial conditions $B(a)$ resp $B(b)$.
   (b) Calculate the Wronskian for (preferably simple) choices of $h_a$ and $h_b$.
   (c) Calculate $G(f)$, with $G$ as defined in the lecture or in the book, Theorem II.6.9 and II.6.7. Instead of a general function $f$, you can also just do it for $f(x) = \sin(nx)$.

1'. *(Optional):* If you want to have more of a challenge, you could do Problem II.6.6 instead of Problem 1. It shows that the assumption that $L$ is injective on its domain $\mathcal{D}$ is not necessary.


3. Do Problem II.7.16 in the book. *Comment:* We have already seen some similarities between operators in $B(\mathcal{H})$ and complex numbers: E.g. any operator $T$ can be written as $T = A + iB$, with $A, B$ selfadjoint. This exercise shows that we also have an analog of polar decomposition for compact operators, where positive operators would correspond to positive real numbers. We will see later that this can also be done for any bounded linear operator on a Hilbert space.