Miniproject 2

Introduction to semigroup theory.

The target is to solve PDEs by formulating them as ODEs in Banach spaces. For instance, heat equation $\partial_t u - \Delta u = 0$ can be written as $\partial_t u = Au$, A is an operator. The main difficulty is that **A is not bounded** in general.

We follow Evans - section 7.4.

⓪ Introduce theory of unbounded operators (Brezis) $\longrightarrow$ Bartek Szcręshy.

① Introduction to semigroups, generators, its domain and motivations $\longrightarrow$ Kuba.

② State and prove Theorem 1 [differential properties of semigroups] [normal, 1 person]

③ State and prove Theorem 2 [properties of generators] [normal, 1 person]

④ Define resolvent operator and sets. Prove theorem 3 on their properties.

[normal, 2 people]

⑤ Prove Hille-Yoshida Theorem [HARD, 2 people]

⑥ Present example in 7.4.3 (a) (Theorem 5) but in the special case $L = -\Delta$ so we solve heat equation on a bounded domain,

[~HARD, 1 person].