In the sequel, \( V \) denotes a vector space defined over the field \( \mathbb{F} = \mathbb{R} \) or \( \mathbb{C} \) unless otherwise specified.

**Problem 1.** Read from the textbook: Chapter 5, Sections 2–4.

**Problem 2** (20pts). From the textbook: Chapter 5, Problem 2.1.

**Problem 3** (20pts). Show that for every polynomial function \( f(x) \in \mathbb{P}_n(\mathbb{R}) \) with real coefficients,
\[
\left( \int_0^1 f(x)dx \right)^2 \leq \int_0^1 f(x)^2 dx.
\]

**Problem 4** (20pts). From the textbook: Chapter 5, Problem 3.1.

**Problem 5** (20pts). From the textbook: Chapter 5, Problem 3.2.

**Problem 6** (20pts). From the textbook: Chapter 5, Problem 4.4.