1. Consider $\vec{x} = (1, -2, 0, 1)$ and $\vec{y} = (2, 0, -3, 1)$ to be elements of the inner product space on $\mathbb{R}^4$.
   (a) Find $|\langle \vec{x}, \vec{y} \rangle|$.
   (b) What upper bound does Cauchy-Schwarz give for this quantity?
2. Consider $f(x) = x$ and $g(x) = \exp(x)$ to be elements of the inner product space $L^2([0, 1])$.
   (a) Find $|\langle f, g \rangle|$.
   (b) What upper bound does Cauchy-Schwarz give for this quantity?
3. Suppose X is an inner product space and fix $y \in X$. Define a function $f : X \to \mathbb{R}$ by $f(x) = \langle x, y \rangle$. Show f is continuous (using the metric space induced by inner product on X and the usual metric space on $\mathbb{R}$.) Hint: Use Cauchy-Schwarz but you knew that already.
4. Show that $\mathbb{R}^n$ is compele under $||\vec{x}||_2$, and hence $\mathbb{R}^n$ is a Hilbert Space under the ussual dot product.