1. Carefully state the definition of “basis”. Give two examples from \( P_1(t) \).

2. Suppose that \( V \) is a vector space with some inner product \( \langle \cdot, \cdot \rangle \). Recall the derived norm is given by \( \|u\| = \sqrt{\langle u, u \rangle} \). Prove that \( \|kv\| = |k|\|v\| \) for all \( v \in V \) and for all \( k \in \mathbb{R} \).
The remaining problems all concern the inner product on $\mathbb{R}^3$ defined by $\langle x, y \rangle_A = x^T A y$, where $A$ is the positive definite matrix $egin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 2 \end{pmatrix}$. Set $u = (0, 1, 1)^T$, $v = (1, 1, 0)^T$.

NOTE: Use this inner product, not the standard inner product, in your answers.

3. Find the projection of $u$ along $v$ and the angle between $u, v$.

4. Find an orthonormal basis for $\text{Span}(u, v)$.

5. Find a basis for $\text{Span}(u, v)^\perp$. 