MATH 54 SPRING 2019: DISCUSSION 109/112 QUIZ#6

GSI: CHRISTOPHER EUR, DATE: 4/2/2019

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Problem 1. Let $\langle \cdot, \cdot \rangle$ be an inner product on $\mathbb{P}_2$ given by

$$\langle p(x), q(x) \rangle = p(-1)q(-1) + p(0)q(0) + p(1)q(1).$$

Compute the projection of $f(x) = 3 + 2t^2$ onto the subspace spanned by $g(x) = 3t - t^2$.

Problem 2. Let $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. Given that $v_1 = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ and $v_2 = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$ are eigenvectors of A, find another eigenvector $v_3 \in \mathbb{R}^3$ of A such that $\{v_1, v_2, v_3\}$ is a basis of $\mathbb{R}^3$.