MATH 54 FALL 2016: DISCUSSION 102/105 QUIZ#11

GSI: CHRISTOPHER EUR, DATE: 11/18/2016

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Problem 1. Define an inner product on $\mathcal{P}_2$ (polynomials in t of degree ≤ 2) by

$$\langle f(t), g(t) \rangle := \int_0^1 f(t)g(t)dt$$

(a) (1 point) Find the orthogonal basis for the subspace $W := \text{span}(1, t)$ of $\mathcal{P}_2$.

(b) (3 points) Find the polynomial $p(t)$ **of degree $\leq$1** that minimizes the quantity

$$\int_0^1 \Big(t^2 + t + 1 - p(t)\Big)^2 dt$$

Problem 2. True/False: (2 points) Assume that all the following are matrices with real coefficients.

(a) An orthogonally diagonalizable matrix is symmetric.

(b) An orthogonal matrix is orthogonally diagonalizable.

(c) If $(v_1, \ldots, v_n)$ is an eigenbasis of a symmetric matrix M, then it is also an orthogonal basis.