

Math 220 Assignment

November 16, 2001

Due Monday, November 19

1. Let P_3 be the vector space of polynomials of degree at most 3, and let φ be the linear map from P_3 to itself that is defined by the formula

$$(\varphi(f))(x) = \int_0^x f'(t) dt ,$$

where f' denotes the derivative of f . Find the matrix of φ with respect to the basis of P_3 given by the powers of the variable.

2. Let P_2 be the vector space of polynomials of degree at most 2. Define a scalar product (analogous to “dot” product) Γ on P_2 with the formula

$$\Gamma(f, g) = \int_0^1 f(t)g(t)dt .$$

Find the orthogonal complement, relative to Γ , of the subspace consisting of the constant polynomials.

3. Use the Gram-Schmidt process (§ 3.4 of the text) to make an orthonormal basis for P_2 , relative to the scalar product Γ of the previous exercise, containing the constant polynomial 1.
4. Repeat the previous exercise using the inner product

$$\Delta(f, g) = \frac{1}{2} \int_{-1}^1 f(t)g(t)dt .$$

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<http://math.albany.edu:8000/math/pers/hammond/course/mat220/assgt/1a011116.html>