Assignment-16

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***Abstract*—This assignment deals with transpose of linear transformation.**

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https://github.com/satyam463/Assignment−16/blob/main/Assignment%2016.tex

1 Problem Statement

Let V be the vector space of all polynomial function over the field of real numbers. Let a and b be fixed real numbers and let f be the linear functional on V defined by

$$f(p) = \int_a^b p(x)\, dx \tag{1.0.1}$$

If D is the differentiation operator on V , what is $D^t f$?

2 Solution

Let

$$p(x) = c_0 + c_1 x + c_2 x^2 + ... + c_n x^n \tag{2.0.1}$$

$$D^t f(p) = f(D(p)) \tag{2.0.2}$$

$$D^t f(p) = f\left(c_1 + 2c_2 x + 3c_3 x^2 + ... + nc_n x^{n-1}\right) \tag{2.0.3}$$

$$D^t f(p) = \int_a^b \left(c_1 + 2c_2 x + 3c_3 x^2 + ... + nc_n x^{n-1}\right) dx \tag{2.0.4}$$

$$D^t f(p) = c_1 x + c_2 x^2 + c_3 x^3 + ... + c_n x^n \Big|_a^b \tag{2.0.5}$$

$$D^t f(p) = p(b) - p(a) \tag{2.0.6}$$